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The University of New Hampshire

Undergraduate Catalog Issue

1969-70

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Calendar

January 1969

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February 1969

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March 1969

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April 1969

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May 1969

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June 1969

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January 1970

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February 1970

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March 1970

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April 1970

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May 1970

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June 1970

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July 1969

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August 1969

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September 1969

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October 1969

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November 1969

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December 1969

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July 1970

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August 1970

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September 1970

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October 1970

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November 1970

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December 1970

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20	21	22	23	24	25	26
27	28	29	30	31	....	....

University Calendar 1969-1970

Semester I

1969

September 14, Sunday	8 A.M. Residence halls open
September 15, Monday	Registration
September 15, Monday	4:00 P.M. First Faculty meeting
September 16, Tuesday	8 A.M. Opening convocation
September 16, Tuesday	10 A.M. Classes follow abbreviated schedule
September 26, Friday	4:30 P.M. Last day to add courses
November 10, Monday	4:30 P.M. Last day to drop courses
November 17, Monday	9 A.M. Mid-semester reports for freshmen due
November 25, Tuesday	7 P.M. Residence halls close, Thanksgiving
November 30, Sunday	2 P.M. Residence halls open
December 1, Monday	8 A.M. Classes resume
December 3, Wednesday	6 P.M. AFROTC Officer Qualification Tests
December 4, Thursday	6 P.M. AFROTC Officer Qualification Tests
December 12, Friday	7 P.M. Residence halls close, Christmas

1970

January 4, Sunday	2 P.M. Residence halls open
January 5-16, Monday-Friday	Reading period
January 19, Monday	8 A.M. Semester I final examinations begin
January 27, Tuesday	9 A.M. Senior grades due
January 29, Thursday	6 P.M. Final examinations end
January 29, Thursday	8 P.M. Residence halls close
February 1, Sunday	Commencement

Semester II

February 8, Sunday	2 P.M. Residence halls open
February 9, Monday	Registration
February 10, Tuesday	8 A.M. Classes resume
February 14, Saturday	Classes hold Monday schedule
February 20, Friday	4:30 P.M. Last day to add courses
March 27, Friday	7 P.M. Residence halls close, Easter
April 5, Sunday	2 P.M. Residence halls open
April 6, Monday	8 A.M. Classes resume
April 13, Monday	4:30 P.M. Last day to drop courses
April 20, Monday	9 A.M. Mid-semester reports for freshmen due
May 11-22, Monday-Friday	Reading period
May 25, Monday	8 A.M. Semester II final examinations begin
May 30, Saturday	Memorial Day — holiday
June 2, Tuesday	9 A.M. Senior grades due
June 5, Friday	6 P.M. Final examinations end
June 7, Sunday	8 P.M. Residence halls close
	Commencement

Trustees and Officers of Administration

Trustees

His Excellency Walter R. Peterson
A.B.
Governor of New Hampshire
ex officio

Frank T. Buckley
Commissioner of Agriculture
ex officio

Newell J. Paire, B.Ed., M.Ed.
Commissioner of Education
ex officio

John W. McConnell
B.A., Ph.D., D.Sc.
President of the University
ex officio

Harold E. Hyde, B.S., M.S., Ed.D.
President of Plymouth State College
ex officio

Roman J. Zorn, B.Ed., Ph.D.
President of Keene State College
ex officio

Fred W. Hall, Jr., B.S., LL.B.
Rochester (1966-1969)
Chairman of the Board

Richard W. Daland, B.S.
Durham (1966-1970)
Vice Chairman of the Board

Norman S. Weeks, B.S.
Laconia (1965-1969)
Secretary of the Board

Maurice F. Devine, A.B., LL.B., LL.D.
Manchester (1949-1970)

J. Fred French
Manchester (1961-1972)

Sinclair Weeks, A.B., LL.D.
Lancaster (1961-1969)

Albert R. Furlong, B.E., M.E.
Keene (1963-1971)

Norman C. Berube, B.A., M.D.
Manchester (1963-1971)

George R. Hanna, B.A., LL.B.
Keene (1963-1971)

Mildred McA. Horton
B.A., M.A., LL.D.
Randolph (1963-1971)

Bernard I. Snierson, A.B., LL.B.
Laconia (1963-1971)

Ray Howland, Jr.
Stratham (1966-1970)

George T. Gilman, B.S.
Farmington (1967-1971)

Mildred K. Perkins, B.E.
Concord (1967-1971)

Charles V. Spanos, B.A., LL.B.
Claremont (1967-1971)

Lewis J. Fisher, LL.B.
Dover (1968-1971)

Frederick C. Walker, B.S., Ed.M.
Dover (1968-1972)

Richard H. Keefe, A.B., LL.D.
Dover (1968-1972)

Officers of Administration

John W. McConnell, Ph.D.
President

Jere A. Chase, M.Ed.
Executive Vice President

Norman W. Myers, B.S.
Vice President-Treasurer

Robert F. Barlow, Ph.D.
Academic Vice President

Robert N. Faiman, Ph.D.
Vice President for Research

Harry A. Keener, Ph.D.
Dean of the College of Agriculture

C. Robert Keesey, B.A.
Dean of Students

Eugene S. Mills, Ph.D.
Dean of the College of Liberal Arts

John B. Hraba, Ph.D.
Dean of the Office of Institutional Research and Planning

Jan E. Clee, Ph.D.
Dean of the Whittemore School of Business and Economics

Trevor Colbourn, Ph.D.
Dean of the Graduate School

Richard S. Davis, Ph.D.
Dean of the College of Technology

William H. Drew, Ph.D.
Coordinator of Research

Donald E. Vincent, A.M.L.S., A.M.
Librarian

Gordon O. Thayer, Ed.D.
Director of the Division of Industrial and Community Services

Keith J. Nighbert, B.A.
Station Manager of WENH-TV

Harry P. Day, Ph.D.
Director of the New England Center for Continuing Education

Leslie C. Turner, M.Ed.
Registrar

Eugene A. Savage, M.Ed.
Director of Admissions

J. R. Sandberg, M.B.A.
Director of Development

Lawrence W. Slanetz, Ph.D.
Director of the Division of Health Studies

Pierre D. Boy, B.S.
Professor of Military Science

Carl G. Yeaton, B.S.
Professor of Aerospace Studies

Faculty

Abell, Max F.
Extension Associate Professor Emeritus of Agricultural Economics
B.S., Cornell University, 1914; PH.D., *ibid.*, 1924. (1926 to 1954)

Babcock, Donald C.
Professor Emeritus of Philosophy
B.A., University of Minnesota, 1907; M.A., *ibid.*, 1908; S.T.B., Boston University, 1912; D.H.L., (Hon.), University of New Hampshire, 1960. (1918 to 1956)

Barraclough, Kenneth E.
Professor Emeritus of Forestry
B.A., New York State College of Forestry, Syracuse University, 1921; M.F., Harvard University, 1940. (1926 to 1963)

Bartley, Irving D.
Associate Professor Emeritus of Music and University Carillonneur
B.M., Syracuse University, 1935; M.M., *ibid.*, 1938. (1945 to 1968)

Bowles, Ella S.
Publications Editor Emeritus
Plymouth Normal School, 1905. (1943 to 1951)

Brackett, Thelma
University Librarian Emeritus
A.B., University of California, 1919; Certificate, California State Library School, 1920; D.H.L. (Hon.), University of New Hampshire, 1962. (1942 to 1962)

Campbell, Willis C.
Research Associate Emeritus, Engineering Experiment Station
B.S., New Hampshire College, 1906. (1938 to 1954)

Carroll, Herbert A.
Professor Emeritus of Psychology
A.B., Bates College, 1923; A.M., Brown University, 1928; PH.D., Columbia University, 1930. (1941 to 1962)

Colby, Halstead N.
Associate Professor Emeritus of Soil and Water Science
B.S., University of New Hampshire, 1930. (1932 to 1936, 1946 to 1968)

Cortez, Edmund A.
Professor Emeritus of Speech
B.A., Taylor University, 1923; B.O., Asbury College, 1924; B.D., Asbury Theological Seminary, 1924; M.A., Columbia University, 1926; ED.M., Harvard University, 1927. (1927 to 1965)

DeQuoy, Ruth W.
Associate State 4-H Leader Emeritus
B.A., New Hampshire College, 1921; M.ED., University of Maryland, 1953. (1929 to 1965)

Donovan, Edward T.
Professor Emeritus of Mechanical Engineering
B.S., University of Wisconsin, 1921. (1926 to 1968)

† Indicates time devoted to Agricultural Experiment Station.
* Indicates time devoted to Cooperative Extension Service.

Ellis, Elizabeth E.
Extension Associate Professor Emeritus of Home Economics
B.S., Teachers College, Columbia University, 1927; M.A., *ibid.*, 1929. (1929 to 1960)

Grinnell, Harold C.
Dean Emeritus, College of Agriculture and Professor Emeritus of Resource Economics
B.S., Cornell University, 1921; M.S., *ibid.*, 1930; PH.D., *ibid.*, 1941. (1932 to 1965)

Hennessy, William G.
Professor Emeritus of English
A.B., Boston University, 1916; A.M., *ibid.*, 1924; D.F.A. (Hon.), Transylvania College, 1966; LITT.D. (Hon.), University of New Hampshire, 1967. (1923 to 1961)

Hitchcock, Leon W.
Professor Emeritus of Electrical Engineerng
B.S., Worcester Polytechnic Institute, 1908. (1910 to 1956)

Huddleston, Eric T.
Professor Emeritus of Architecture
B.ARCH., Cornell University, 1910. (1914 to 1957)

Iddles, Harold A.
Professor Emeritus of Chemistry
B.S., Michigan State College, 1918; M.S., University of Iowa, 1921; PH.D., Columbia University, 1925; D.SC., (Hon.), University of New Hampshire, 1966. (1929 to 1965)

Jackson, C. Floyd
Professor Emeritus of Zoology
B.A., DePauw University, 1905; M.S., Ohio State University, 1907; D.SC. (Hon.), University of New Hampshire, 1961. (1908 to 1952)

Johnson, Arthur W.
Professor Emeritus of Business and Economics
B.B.A., College of Business Administration, Boston University, 1922; M.B.A., *ibid.*, 1929; C.P.A. (1920 to 1963)

Johnson, G. Reid
Associate Professor Emeritus of History
A.B., Muskingum College, 1916; M.A., Princeton University, 1920; PH.D., University of Edinburgh, 1922. (1932 to 1963)

Koch, Wayne S.
Professor Emeritus of Education
B.S., Muhlenberg College, 1941; ED.M., Harvard University, 1945. (1945 to 1968)

Lavine, Irvin
Professor Emeritus of Chemical Engineering
B.S., University of Minnesota, 1924; PH.D., *ibid.*, 1930. (1948 to 1949, 1951 to 1965)

Mills, Marian E.
Assistant Professor Emeritus of Botany
B.S., Teachers College, Columbia University, 1917; M.A., *ibid.*, 1920. (1927 to 1957)

Morrow, Kenneth S.
Professor Emeritus of Dairy Science
B.S., University of Minnesota, 1918; M.S., *ibid.*, 1925. (1934 to 1966)

O'Brien, Daniel A.
County Agent Leader Emeritus
B.S., Cornell University, 1913. (1920 to 1953)

O'Kane, Walter C.
Professor Emeritus of Economic Entomology
B.A., Ohio State University, 1897; M.A., *ibid.*, 1909; D.SC. (Hon.), *ibid.*, 1932. (1909 to 1947)

Parker, Clifford S.
Professor Emeritus of Languages
A.B., Harvard University, 1912; A.M., *ibid.*, 1914; PH.D., Columbia University, 1925; D.H.L. (Hon.), Universiy of New Hampshire, 1964. (1931 to 1960)

Perry, Errol C.
Assistant Professor Emeritus of Farm Management, Thompson School of Agriculture
B.S., Massachusetts State College, 1920. (1929 to 1942, 1946 to 1962)

Phillips, Thomas G.
Professor Emeritus of Agricultural and Biological Chemistry
B.S., Ohio State University, 1912; M.S., *ibid.*, 1913; PH.D., University of Chicago, 1918. (1925 to 1957)

Prince, Ford S.
Professor Emeritus of Agronomy
B.S., University of Illinois, 1913. (1925 to 1957)

Rasmussen, Edwin J.
Extension Professor Emeritus of Horticulture
B.S., University of Wisconsin, 1927; M.S., *ibid.*, 1929. (1929 to 1936, 1947 to 1962)

Richardson, Edythe T.
Professor Emeritus of Zoology
B.S., New Hampshire College, 1922; M.S., University of New Hampshire, 1924. (1922 to 1966)

Sackett, Everett B.
Dean Emeritus of the College of Liberal Arts and Professor Emeritus of Education
B.A., Hamline University, 1923; M.A., University of Minnesota, 1926; PH.D., Columbia University, 1931. (1938 to 1967)

Seiberlich, Joseph
Research Professor Emeritus, Engineering Experiment Station
Diploma Ingenieur, Technical University, Karlsruhe, Germany, 1924; Doctor Ingenieur, *ibid.*, 1928. (1941 to 1962)

Shimer, Stanley R.
Professor Emeritus of Biochemistry
B.S., Muhlenberg College, 1918; M.S., Pennsylvania State College, 1923. (1924 to 1966)

Skelton, Russell R.
Professor Emeritus of Civil Engineering
B.S., Purdue University, 1924; C.E., *ibid.*, 1934; S.M., Harvard University, 1939. (1928 to 1966)

Stevens, Clark L.
Professor Emeritus of Forestry
B.S., New Hampshire College, 1917; M.F., Yale University, 1926; PH.D., *ibid.*, 1930. (1919 to 1964)

Stevens, Henry B.
Director Emeritus of University Extension Service
A.B., Dartmouth College, 1912. (1918 to 1956)

Stolworthy E. Howard
Professor Emeritus of Mechanical Engineering
B.S., Tufts College, 1922. (1922 to 1968)

Swasey, Henry C.
Associate Professor Emeritus of Physical Education and Athletics for Men
B.S., Amherst College, 1915; M.S., Indiana University, 1941. (1921 to 1962)

Thames, Sarah
Associate Professor Emeritus of Home Economics
B.S., Simmons College, 1930; M.A., Teachers College, Columbia University 1942. (1945 to 1961)

Tirrell, Loring V.
Professor Emeritus of Animal Science
B.S., Massachusetts Agricultural College, 1920; M.S., Massachusetts State College, 1941. (1921 to 1925, 1930 to 1966)

Tyrrell, Doris E.
Associate Professor Emeritus of Secretarial Studies
B.S., University of Minnesota, 1926; M.A., *ibid.*, 1932. (1938 to 1966)

Walsh, John S.
Professor Emeritus of Languages
A.B., Harvard University, 1915; A.M., Boston University, 1928; D.H.L. (Hon.), University of New Hampshire, 1965. (1922 to 1962)

Woodruff, Ruth J.
Professor Emeritus of Economics
B.A., Bryn Mawr, 1919; A.M., *ibid.*, 1920; PH.D., Radcliffe College, 1931. (1931 to 1967)

Yale, William
Professor Emeritus of History
PH.D., Sheffield Scientific School, Yale University, 1910; M.A., University of New Hampshire, 1928. (1928 to 1957)

Abbott, Helen D.
Head Cataloger, Associate Professor
A.B., Wheaton College, 1929; S.B. in L.S., Simmons College, 1930; A.M., Middlebury College, 1939. Appointed 1943.

Adams, Robert L. A.
Instructor in Geography
B.A., Williams College, 1961; M.A., Clark University 1966. Appointed 1967.

Adamovich, Frank W.
Assistant Documents Librarian
B.S., Fitchburg State Teachers College, 1960; M.A., Simmons College, 1968. Appointed 1968.

Agarwal, Anand B. L.
Assistant Professor of Mechanical Engineering
B.S., Banaras Hindu University, 1958; M.S., University of Roorkee, 1962; PH.D., University of Michigan, 1968. Appointed 1968.

Agenbroad, James E.
Assistant to Librarian and Machine Systems Librarian; Assistant Professor
A.B., Miami University, 1956; M.L.S., Rutgers University, 1960. Appointed 1960.

Agenbroad, Jean Ann
Children's Librarian; Instructor
A.B., Berea College, 1959; M.L.S., Rutgers University, 1962. Appointed 1966.

Albers, Carl H.
Adjunct Professor, Whittemore School of Business and Economics
B.A., Valley City State Teachers College, 1943; M.B.A., University of Denver, 1947. Appointed 1968.

Allard, John A.
Major, U.S.A., Assistant Professor of Military Science
B.A., University of Vermont, 1961. Appointed 1968.

†Allen, Fred E.
Professor of Animal Science and Veterinarian
B.S., University of New Hampshire, 1932; D.V.M., Ohio State University, 1936. Appointed 1940.

Allen, Richard
Associate Professor of Hospital Administration, Whittemore School of Business and Economics
B.S., Trinity University, 1954; M.H.A., Baylor University, 1957. Appointed 1968.

Allmendinger, E. Eugene
Associate Professor of Mechanical Engineering
B.S., University of Michigan, 1941; M.S., University of New Hampshire, 1950. Appointed 1958.

Alperi, Robert W.
Assistant Professor of Mechanical Engineering
B.S., Michigan Technical University, 1958; M.S., Rensselaer Polytechnic Institute, 1961; PH.D., University of Connecticut, 1968. Appointed 1967.

Amell, Alexander R.
Professor of Chemistry
B.S., University of Massachusetts, 1947; PH.D., University of Wisconsin, 1950. Appointed 1955.

Amman, William, M.D.
Lecturer in Occupational Therapy
M.R.C.S., L.R.C.P., University College Hospital. 1937; Diploma of Public Health, 1944, University of Cape Town, L.M.C.C., Canada, 1950. Appointed 1965.

Amsden, Katherine
Assistant Professor of Physical Education
A.B., Sweet Briar College, 1953; MS., Smith College, 1956; PH.D., University of Southern California, 1967. Appointed 1967.

Andersen, Kenneth K.
Associate Professor of Chemistry
B.S., Rutgers University, 1955; PH.D., University of Minnesota, 1959. Appointed 1960.

Anderson, Charlotte K.
Assistant Librarian and Documents Librarian; Professor
B.A., University of Michigan, 1935; A.B.L.S., *ibid.*, 1951. Appointed 1943.

Anderson, Franz E.
Assistant Professor of Geology
B.A., Ohio Wesleyan University, 1960; M.S., Northwestern University, 1962; PH.D., University of Washington, 1967.
Appointed 1967.

Andrew, Michael D.
Assistant Professor of Education
B.S., Cornell University, 1960; A.M.T., Harvard University, 1961.
Appointed 1966.

†Andrews, Richard A.
Associate Professor of Resource Economics
B.S., University of Maine, 1949; M.S., Pennsylvania State University, 1951; PH.D., University of Minnesota, 1959.
Appointed 1959.

Annis, William H.
Associate Professor of Agricultural Education
B.S., University of Maine, 1951; M.AGRIC.ED., University of New Hampshire, 1959; ED.D., Cornell University, 1961. Appointed. 1962.

Archambault, Raymond R.
Cataloger; Assistant Professor
B.A., University of Maine, 1949; M.S., Syracuse University, 1959.
Appointed 1965.

Arnold, Charles G.
Assistant Professor of Physical Education
B.S., Springfield College, 1951; M.S., *ibid.*, 1952. Appointed 1966.

Arnoldy, Roger L.
Assistant Professor of Physics
B.S., St. Mary's College, 1956; M.S., University of Minnesota, 1959; PH.D., *ibid.*, 1962. Appointed 1967.

Atwood, Janet
Associate Professor of Physical Education
B.S., Skidmore College, 1950; M.A., State University of Iowa, 1955. Appointed 1962.

Aultman, Dwight E., III
Instructor in Physical Education and Physical Therapist Trainer
B.S., Medical College of Virginia, 1956.
Appointed 1966.

Austin, Gilbert R.
Assistant Professor of Education
B.S., Central Connecticut College, 1953; M.A.L.S., Wesleyan University, 1956; C.A.G.S., University of Hartford, 1959; PH.D., University of Connecticut, 1965.
Appointed 1965.

Azzi, Victor D.
Associate Professor of Mechanics
B.S., University of New Hampshire, 1955; D.ENG., Yale University, 1961.
Appointed 1965.

Bach, Dirk P.
Assistant Professor of The Arts
B.F.A., Colgate University, 1961; M.A., University of Denver, 1962; M.A., University of Michigan, 1964.
Appointed 1965.

Balderacci, Arthur E.
Assistant Professor of The Arts
A.B., Duke University, 1960; M.F.A., University of Georgia, 1965.
Appointed 1965.

Balling, Ludwig C.
Assistant Professor of Physics
B.A., Oberlin College, 1960; M.A., Harvard University, 1961; PH.D., *ibid.*, 1965.
Appointed 1967.

Balomenos, Richard H.
Professor of Mathematics Education
B.S., United States Merchant Marine Academy, 1952; M.A., New York University, 1956; ED.D., Harvard University, 1961.
Appointed 1961.

Bardwell, John D.
Director, Audio-Visual Center and Media Specialist for the New England Regional Center
A.A., Boston University, 1950; B.S., Gorham State Teachers College, 1952; M.ED., University of New Hampshire, 1955.
Appointed 1960.

Barlow, Robert F.
Academic Vice President and Professor of Economics
B.A., Colby College, 1950; M.A., Fletcher School of Law and Diplomacy, Tufts University, 1951; PH.D., *ibid.*, 1960.
Appointed 1962.

†Barrett, James P.
Associate Professor of Forest Resources
B.S., North Carolina State University, 1953; M.F., Duke University, 1957; PH.D., *ibid.*, 1962. Appointed 1967.

Barstow, Thomas R.
Assistant Professor of Physical Education
B.S., St. Lawrence University, 1961; M.ED., *ibid.*, 1965. Appointed 1965.

†Bartley, Clara H.
Research Associate in Microbiology
B.S., Miami University, 1923; M.A., University of Michigan, 1926; PH.D., University of Kansas, 1935. Appointed 1945.

Barton, Philip S.
Professor of Applied Animal Science and Director, Thompson School of Applied Science
B.S., University of New Hampshire, 1928; M.ED., *ibid.*, 1938. Appointed 1939.

Batchelder, Gerald M.
Research Associate Professor, Engineering Experiment Station and Adjunct Associate Professor of Civil Engineering
B.S., University of New Hampshire, 1950; M.S.C.E., Purdue University, 1952.
Appointed 1953.

Batcheller, Joseph D.
Professor of Speech and Drama
A.B., Carnegie Institute of Technology, 1936; A.M., University of Minnesota, 1938; PH.D., *ibid.*, 1942.
Appointed 1944.

Batho, Edward H.
Professor of Mathematics
B.S., Fordham University, 1950; M.S., University of Wisconsin, 1952; PH.D., *ibid.*, 1955. Appointed 1960.

Beasley, Wayne M.
Research Associate Professor, Engineering Experiment Station, and Adjunct Associate Professor of Materials Science
S.B., Harvard College, 1945; S.M., Massachusetts Institute of Technology, 1965.
Appointed 1957.

Bechtell, Homer F., Jr.
Associate Professor of Mathematics
B.S., Grove City College, 1951; M.A., University of Wisconsin, 1956; PH.D., *ibid.*, 1963. Appointed 1966.

Beckett, John A.
Forbes Professor of Management
B.S., University of Oregon, 1939; M.B.A., Harvard University, 1946; C.P.A.
Appointed 1962.

Beckwith, Marion C.
Professor of Physical Education
A.B., Oberlin College, 1935; M.ED., University of New Hampshire, 1937.
Appointed 1935.

Bell, R. Virginia
Assistant Professor of Occupational Therapy
B.S., University of Michigan, 1953; Certificate O.T.R., Boston School of Occupational Therapy, 1955. Appointed 1958.

Bennett, Albert B.
Assistant Professor of Mathematics
B.S., Maine Maritime Academy, 1954; B.S., University of Maine, 1958; M.A., *ibid.*, 1959; ED.D., University of Michigan, 1966. Appointed 1967.

Berney, Charles V.
Assistant Professor of Chemistry
B.S., Whitman College, 1953; PH.D., University of Washington, 1962.
Appointed 1965.

Bernier, Raymond
Instructor and Technical Director in Speech and Drama
B.S., Bradford Durfee College, 1958; M.ED., Bridgewater State College, 1960; M.A., Smith College, 1967.
Appointed 1967.

Bethel, John E.
Assistant in Music
B.S., New York College of Music, 1968.
Appointed 1968.

Bingham, Sylvester H.
Professor of English
A.B., Dartmouth College, 1922; A.M., Harvard University, 1929; PH.D., Yale University, 1937. Appointed 1936.

Birmingham, Frank P.
Instructor in Philosophy
B.A., University of Kansas, 1963; M.A., University of Michigan, 1966.
Appointed 1968.

Blanchard, Fletcher A.
Professor of Electrical Engineering
B.S., Union College, 1948; M.S., Lehigh University, 1950.
Appointed 1950.

†Blickle, Robert L.
Professor of Entomology
B.S., Ohio State University, 1937; M.S., University of New Hampshire, 1939; PH.D., Ohio State University, 1942.
Appointed 1938 to 1941, 1946.

Blood, Edward J.
Assistant Professor of Physical Education and Athletics
B.S., University of New Hampshire, 1935.
Appointed 1936.

Bobick, Melvin T.
Associate Professor of Sociology
A.B., University of Illinois, 1949; A.M., *ibid.*, 1952; PH.D., *ibid.*, 1958.
Appointed 1958.

Bolland, Thomas W.
Assistant Professor of Business Administration
B.B.A., University of Cincinatti, 1953; M.B.A., University of Chicago, 1957; PH.D., *ibid.*, 1966. Appointed 1967.

Bonnice, William E.
Associate Professor of Mathematics
B.A.E., Syracuse University, 1951; M.S., University of Washington, 1960; PH.D., *ibid.*, 1962. Appointed 1962.

Borror, Arthur C.
Associate Professor of Zoology
B.S., Ohio State University, 1956; M.S., *ibid.*, 1958; PH.D., Florida State University, 1961. Appointed 1961.

Bosserman, Carol S.
Lecturer in German
B.A., Middlebury Deutsche Sommerschule. 1965. Appointed 1965.

Bothner, Wallace A.
Assistant Professor of Geology
B.A., Hapur College, 1963; PH.D., University of Wyoming, 1967.
Appointed 1967.

***†Bowring, James R.**
Professor of Resource Economics
B.S.A., University of Manitoba, 1936; M.A., University of Alberta, 1941; PH.D., Iowa State College, 1944. Appointed 1948.

Boy, Angelo V.
Associate Professor of Education
A.B., University of Notre Dame, 1953; ED.M., Boston University, 1955; ED.D., *ibid.*, 1960. Appointed 1964.

Boy, Pierre D.
Colonel, U.S.A., Professor of Military Science
B.S., University of New Hampshire, 1939.
Appointed 1965.

***Boynton, C. Hilton**
Professor of Dairy Science
B.S., Iowa State College, 1934; M.S., *ibid.*, 1940; PH.D., Rutgers University, 1962.
Appointed 1945.

Boynton, Jason E.
Assistant Professor of Education
B.ED., Plymouth Teachers College, 1949; M.ED., University of New Hampshire, 1952. Appointed 1966.

Bozak, John C., Jr.
Assistant Professor of Forest Technology
B.S., University of Connecticut, 1962; M.F., Yale School of Forestry, 1963.
Appointed 1967.

Braff, Allan J.
Associate Professor of Economics and Business
A.B., University of Rochester, 1951; M.B.A., Columbia University, 1953; PH.D., University of Wisconsin, 1959.
Appointed 1965.

Bratton, Karl H.
Professor of Music
B.M., University of Kansas, 1931; M.A., Teachers College, Columbia University, 1945. Appointed 1945.

Bravo, Donald
Lecturer in Music
B.M., New England Conservatory of Music, 1956; M.M., Boston Conservatory of Music, 1964. Appointed 1967.

Breeding, Charles H. J., Jr.
Assistant Professor of Applied Soil Sciences, Thompson School of Applied Science
B.S., University of New Hampshire, 1949; M.S., *Ibid.*, 1966. Appointed 1963.

Briggs, Janet C.
Lecturer in Animal Science
B.S., University of Massachusetts, 1962. Appointed 1963.

Brinsfield, Shirley D.
Adjunct Professor, Whittemore School of Business and Economics
B.A., University of Washington, 1949; LL.B., Columbia Law School, Columbia University, 1952. Appointed 1968.

Brockleman, Paul T.
Assistant Professor of Philosophy
A.B., Dartmouth College, 1957; M.A., Northwestern University, 1963; PH.D., *ibid.*, 1968. Appointed 1963.

Brodman, Barbara
Instructor in Spanish
B.A., University of Vermont, 1965; M.A., University of New Hampshire, 1968.
Appointed 1967.

Brown, Richard G.
Instructor in Mathematics and Education
A.B., University of Rochester, 1958; M.A., University of Michigan, 1968.
Appointed 1968.

Browne, Evelyn
Professor of Physical Education
A.B., University of California, 1943; M.A., Teachers College, Columbia University, 1943; M.A., University of New Hampshire, 1962. Appointed 1943.

Bruce, Robert J.
Captain, U.S.A., Assistant Professor of Military Science
B.S., University of New Hampshire, 1963.
Appointed 1968.

†Bruns, Paul E.
Professor of Forest Resources
A.B., New York University, 1937; M.F., Yale University, 1940; PH.D., University of Washington, 1956. Appointed 1958.

Bryce, Forbes O.
Lecturer in Sociology
B.S., Massachusetts Maritime Academy, 1936; M.A., American University, 1961; M.A., University of New Hampshire, 1968.
Appointed 1962.

Buckelew, Albert R.
Research Associate in Biochemistry
B.S., Fairleigh Dickinson University, 1964; PH.D., University of New Hampshire, 1968.
Appointed 1968.

Bullock, Wilbur L.
Professor of Zoology
B.S., Queens College, 1942; M.S., University of Illinois, 1947; PH.D., *ibid.*, 1948.
Appointed 1948.

Bunker, Laurel G.
Assistant Professor of Occupational Therapy
B.S., Tufts College, 1951; M.A., California State College at Los Angeles, 1967.
Appointed 1968.

Burke, James, Jr.
Research Associate in Microbiology
B.S., Merrimack College, 1961.
Appointed 1965.

Burns, Thomas R.
Assistant Professor of Sociology
B.S., Stanford University, 1959; M.A., *ibid.*, 1963. Appointed 1968.

Burrows, Julia M. L.
Instructor in Occupational Therapy
B.S., University of New Hampshire, 1959. Appointed 1966.

Burton, David M.
Associate Professor of Mathematics
B.A., Clark University, 1954; A.M., University of Rochester, 1956; PH.D., *ibid.*, 1961. Appointed 1959.

Burton, Royce E.
Instructor in English
B.A., University of Texas, 1966; M.A., ibid., 1968. Appointed 1968.

Burtt, Elizabeth A.
Assistant Professor of Nursing
R.N., Hillsboro County General Hospital, 1947; B.S., McCoy College, Johns Hopkins University, 1961; M.S., Boston University, 1965. Appointed 1968.

†Byers, Gordon L.
Professor of Soil and Water Science
B.S., McGill University, 1948; M.S.A., Ontario Agricultural College, 1950. Appointed 1956.

Cabral, Robert M.
Instructor in Sociology
B.A., University of Massachusetts, 1965; M.A., *ibid.*, 1967. Appointed 1969.

Cady, Samuel L.
Instructor in The Arts
B.A., University of New Hampshire, 1965; M.A., Indiana University, 1967. Appointed 1968.

Caldwell, S. Anthony
Assistant Professor of English
A.B., Columbia College, 1952; M.A., Columbia University, 1953; PH.D., Harvard University, 1968. Appointed 1957.

Callanan, Harold J., Jr.
Instructor in History
A.B., Boston University, 1960; A.M., *ibid.*, 1961. Appointed 1968.

Cappon, Alfredo
Instructor in German
B.A., Middlebury, 1963; M.A., University of New Hampshire, 1965. Appointed 1966.

Carbonneau, Lionel J.
Coach of Lacrosse and Assistant Professor of Physical Education
B.A., University of New Hampshire, 1952. Appointed 1965.

Carnicelli, Thomas A.
Assistant Professor of Spanish
A.B., Princeton University, 1958; M.A., Harvard University, 1960; PH.D., *ibid.*, 1966. Appointed 1967.

Carter, Gavin H.
Chairman, Department of Physical Education for Men, and Associate Professor of Physical Education
B.S., Springfield College, 1952; M.S., *ibid.*, 1953; PH.D., University of Oregon, 1958. Appointed 1965.

Casas, R. Alberto
Professor of Spanish
B.EN L., Universidad de Barcelonia, 1936; A.M., Columbia University, 1947; PH.D., *ibid.*, 1954. Appointed 1952.

Casey, Inger R.
Lecturer in German
Filosofie ambetsexamen, University of Stockholm, 1966. Appointed 1968.

Chaltas, John G.
Associate Professor of Education
B.S., South Connecticut State University, 1951; M.A., Columbia University, 1953; ED.D., *ibid.*, 1957. Appointed 1967.

Chapman, Donald H.
Professor of Geology
B.A., University of Michigan, 1927; M.A., *ibid.*, 1928; PH.D., *ibid.*, 1931. Appointed 1931.

Chase, Jere A.
Executive Vice President
B.S., University of New Hampshire, 1936; M.ED., *ibid.*, 1946. Appointed 1946.

Chase, Mary K.
Graphic Designer and Instructor in The Arts
B.F.A., Rhode Island School of Design, 1967; M.A.T., *ibid.*, 1968.
Appointed 1968.

Chesbro, William R.
Professor of Microbiology
B.S., Illinois Institute of Technology, 1951; M.S., *ibid.*, 1955; PH.D., *ibid.*, 1959.
Appointed 1959.

†Ching, Chauncey T. K.
Assistant Professor of Resource Economics
A.B., University of California, 1962; M.S., *ibid.*, 1965; PH.D., *ibid.*, 1967.
Appointed 1968.

Chittenden, David H.
Assistant Professor of Chemical Engineering
B.S., Illinois Institute of Technology, 1956; M.S., University of Wisconsin, 1957; PH.D., *ibid.*, 1961.
Appointed 1963.

Chitwood, Donna L.
Instructor in English
B.A., Case Western Reserve University, 1964. Appointed 1968.

Chupp, Edward L.
Professor of Physics
A.B., University of California, 1950; PH.D., *ibid.*, 1954. Appointed 1962.

Clark, Charles E.
Assistant Professor of History
A.B., Bates College, 1950; M.S. Columbia University, 1952; PH.D., Brown University, 1966. Appointed 1967.

Clark, David G.
Associate Professor of Physics
B.A., Park College, 1938; M.S., Texas Agricultural and Mechanical College, 1940; PH.D., Pennsylvania State College, 1947.
Appointed 1947.

Clark, Ronald R.
Associate Professor of Electrical Engineering
B.S., University of New Hampshire, 1956; M.E., Yale University, 1957; PH.D., Syracuse University, 1963. Appointed 1957.

Clark, William E.
Assistant Professor of Mechanical Engineering
B.S., University of New Hampshire, 1931.
Appointed 1946.

Clee, Jan E.
Dean of the Whittemore School of Business and Economics and Associate Professor of Organizational Development
B.A., Social Academy, 1953; M.S., Case Institute, 1963; PH.D., *ibid.*, 1967.
Appointed 1967.

Cochrane, Tuovi S.
Instructor in Physical Education
Graduate of University of Helsinki, 1963.
Appointed 1966.

Cohen, Allan R.
Assistant Professor of Business Administration
A.B., Amherst College, 1959; M.B.A., Harvard Graduate School of Business Administration, 1961; D.B.A., *ibid.*, 1967.
Appointed 1967.

Cohen, Joyce W.
Instructor in English
B.A., University of New Hampshire, 1967; M.A., University of Toronto, 1968.
Appointed 1968.

Colbourn, Trevor
Dean of the Graduate School and Professor of History
B.A., University of London, 1948; M.A., College of William and Mary, 1949; M.A., Johns Hopkins University, 1951; PH.D., *ibid.*, 1953. Appointed 1967.

Cole, Lawrence P.
Assistant Professor of Economics
B.ED., Keene Teachers College, 1959; M.S., Purdue University, 1964. Appointed 1966.

Collins, Joan F.
Instructor in Nursing
B.S., Saint Anselm's College, 1968.
Appointed 1968.

†Collins, Walter M.
Professor of Poultry Science
B.S., University of Connecticut, 1940; M.S., *ibid.*, 1949; PH.D., Iowa State University, 1960. Appointed 1951.

†Colovos, Nicholas F.
Professor of Animal Science
B.S., University of New Hampshire, 1927; M.S., *ibid.*, 1931. Appointed 1928.

Congdon, Robert C.
Director of Counseling and Testing Service and Assistant Professor of Psychology
A.B., University of California, 1947; ED.D., Harvard University, 1961.
Appointed 1952.

†Conklin, James G.
Professor of Entomology
B.S., Connecticut Agricultural College, 1926; M.S., University of New Hampshire, 1929; PH.D., Ohio State University, 1941. Appointed 1931.

Conner, Theodore W.
Coach of Baseball and Assistant Professor of Physical Education
B.S., Springfield College, 1955; M.S., University of Illinois, 1958. Appointed 1962.

Conway, Frank J.
Assistant Coach of Athletics and Lecturer in Physical Education
B.S., University of Arkansas, 1961; M.ED., *ibid.*, 1962. Appointed 1968.

Coolidge, Clyde R.
Visiting Lecturer in Business Administration
B.A., University of New Hampshire, 1960; LL.B., Boston College Law School, 1963.
Appointed 1966.

Cooper, Carl J.
Psychologist, Counseling Service and Assistant Professor of Education
A.B., Bowdoin College, 1949; ED.M., Boston University, 1954; PH.D., University of Massachusetts, 1962. Appointed 1965.

Copeland, Arthur H., Jr.
Professor of Mathematics
B.S., University of Michigan, 1949; M.A., *ibid.*, 1950; PH.D., Massachusetts Institute of Technology, 1954.
Appointed 1968.

Copeland, Lynda P.
Lecturer in Music
B.M., University of Michigan, 1947; B.M., New England Conservatory of Music, 1952. Appointed 1968.

†Corbett, Alan C.
Associate Professor of Poultry Science
B.S., University of Maine, 1936; M.S., *ibid.*, 1937; D.V.M., Michigan State College, 1940. Appointed 1941.

Corell, Robert W.
Professor of Mechanical Engineering
B.S.M.E., Case Institute of Technology, 1956; M.S.M.E., Massachusetts Institute of Technology, 1959; PH.D., Case Institute of Technology, 1964. Appointed 1964.

Courtemanche, Mildred H.
Consultant Nurse Trainer
B.S., Boston University School of Nursing, 1949. Appointed 1967.

Cox, Gerald
Instructor in Physical Education
B.S., State University of New York at Cortland, 1955. Appointed 1967.

Craig, Robert E.
Instructor in Political Science
B.A., Adelphi University, 1960.
Appointed 1966.

Crane, Robert W.
Captain, USAF, Assistant Professor of Aerospace Studies
B.S., Husson College, 1956.
Appointed 1968.

Croker, Robert A.
Assistant Professor of Zoology
A.B., Adelphi College, 1958; M.S., University of Miami, 1960; PH.D., Emory University, 1966. Appointed 1966.

Curcio, Ronald P.
Instructor in Education
B.A., Boston College, 1960; M.A., Fordham University, 1962. Appointed 1968.

Curwood, Sarah T.
Regional Training Officer and Lecturer in Education
A.B., Cornell University, 1937; ED.M., Nursery Training School of Boston, 1947; PH.D., Radcliffe College, 1956. Appointed 1968.

Cushing, Daniel
Honorary Fellow in Metallurgy
PH.B., Yale University, 1912. Appointed 1952.

Daggett, Albert F.
Professor of Chemistry
B.S., University of New Hampshire, 1928; M.S., *ibid.*, 1930; PH.D., Columbia University, 1934. Appointed 1928 to 31, 1935.

Daggett, G. Harris
Professor of English
A.B., Cornell University, 1928; M.A., *ibid.*, 1929; PH.D., University of North Carolina, 1941. Appointed 1942.

Danoff, Alexander P.
Assistant Professor of German
A.B., New York University, 1928; A.M., *ibid.*, 1929. Appointed 1948.

Datilio, Louis J.
Instructor in Physical Education
B.S., Temple University, 1961; M.A., Trenton State College, 1967. Appointed 1967.

Dauphinais, Edward J.
State Technical Information Librarian; Assistant Professor
B.A., Hillyer College, 1956; M.S.L.S., Simmons College, 1960. Appointed 1968.

Davenport, Gilbert B.
Assistant Professor in Speech and Drama
B.A., Western Reserve University, 1956; Certification, Naval Intelligence School, 1958; M.A., University of Denver, 1961. Appointed 1962.

Davies, B. Carolyn
Assistant Professor of Nursing
B.S., Boston University School of Nursing, 1949; ED.M., Harvard University School of Education, 1964. Appointed 1969.

†Davis, Henry A.
Associate Professor of Analytical Services
B.S., University of New Hampshire, 1932; M.S., *ibid.*, 1934. Appointed 1932.

Davis, Myra L.
Associate Professor of Secretarial Studies
B.S., Central Missouri State Teachers College, 1939; M.A., State University of Iowa, 1945. Appointed 1945.

Davis, Richard S.
Dean of the College of Technology and Professor of Materials Science
BA.SC., University of Toronto, 1951; MA.SC., *ibid.*, 1952; PH.D., *ibid.*, 1954. Appointed 1968.

Davis, Ruth E.
Associate Professor of Home Economics
B.S., Ohio University, 1935; M.A., Washington State University, 1959. Appointed 1960 to 1965, 1966.

Dawson, Charles O.
Professor of Civil Engineering
B.C.E., Ohio State University, 1930; M.S., *ibid.*, 1940. Appointed 1930.

Dawson, John F.
Assistant Professor of Physics
B.S., Antioch College, 1958; PH.D., Stanford University, 1963. Appointed 1968.

Deane, Nancy H.
Instructor in English
B.A., Albion College, 1962; M.A., University of Wisconsin, 1964. Appointed 1966.

Degler, Carroll M.
Professor of Business and Economics
A.B., University of Kansas, 1925; M.B.A., New York University, 1927.
Appointed 1928.

Deichert, Lillian C.
Loan Librarian; Assistant Professor
A.B., Hunter College, 1933; M.L.S., Pratt Institute, 1960. Appointed 1964.

Deoss, Dister L.
Captain, USA, Assistant Professor of Military Science
B.S., University of New Hampshire, 1957.
Appointed 1967.

Desjardins, Andrea Ruth
Instructor in Home Economics
B.S., Russell Sage College, 1965; M.A., Michigan State University, 1967.
Appointed 1967.

Desrosiers, Richard V.
Instructor in Classics
A.B., Boston College, 1960; A.M., University of Wisconsin, 1961.
Appointed 1965.

Devincenzo, Salvatore, Jr.
Major, USAF, Assistant Professor of Aerospace Studies
B.B.A., University of Miami, 1955.
Appointed 1969.

Devoto, Mark B.
Assistant Professor of Music
A.B., Harvard College, 1961; M.F.A., Princeton University, 1963; PH.D., *ibid.*, 1967. Appointed 1968.

Dewey, Richard S.
Professor of Sociology
A.A., Pasadena Jr. College, 1934; A.B., College of Wooster, 1936; M.A., Oberlin College, 1939; PH.D., University of Wisconsin, 1941. Appointed 1958.

DiBenedetto, Barbara A.
Instructor in Nursing
R.N., Mount Auburn Hospital School of Nursing, 1965; B.S., Boston University, 1968. Appointed 1968.

Dimambro, Arthur R., M.D.
Lecturer in Occupational Therapy
B.S., University of New Hampshire, 1951; M.D., University of Vermont, 1955.
Appointed 1965.

Dishman, Robert B.
Professor of Political Science
A.B., University of Missouri, 1939; A.M., *ibid.*, 1940; PH.D., Princeton University, 1948. Appointed 1951.

Dodds, John A.
Associate Professor of Applied Animal Science, Thompson School of Applied Science
B.S., University of Vermont, 1936; M.AGR.ED., University of New Hampshire, 1960. Appointed 1953.

Dodge, Peter
Associate Professor of Sociology
B.A., Swarthmore College, 1948; A.M., Harvard University, 1950; PH.D., *ibid.*, 1961. Appointed 1964.

***Dodrill, Isabel**
State Home Economics Leader, Cooperative Extension Service, and Associate Professor of Home Economics
A.B., Fort Hays State College, 1937; B.S., Kansas State University, 1941; M.A., Teachers College, Columbia University, 1957. Appointed 1965.

Donovan, John V.
Assistant Professor of Economics
A.B., Boston College, 1961.
Appointed 1965.

Dotchin, L. William, Jr.
Research Physicist, Space Science Center, and Instructor in Physics
B.S., Bates College, 1962; M.S., University of New Hampshire, 1965. Appointed 1965.

Dowling, John, Jr.
Assistant Professor of Physics
B.S., University of Dayton, 1960; M.S., Arizona State University, 1962; PH.D., *ibid.*, 1964. Appointed 1965.

Downs, Richard E.
Associate Professor of Anthropology
S.B., Harvard University, 1942; Cert. of Ethn., University of Paris, 1949; PH.D., University of Leiden, 1956.
Appointed 1962.

Draves, David D.
Associate Professor of Education
B.A., University of Wisconsin, 1948; M.A., *ibid.*, 1949; PH.D., *ibid.*, 1957.
Appointed 1964.

Drew, William H.
Associate Dean of the Graduate School and Professor of Resource Economics
B.S., Pennsylvania State College, 1947; M.S., Rutgers University, 1949; PH.D., Vanderbilt University, 1961.
Appointed 1956.

Drinker, Frances S.
Lecturer in Music
B.M., Boston University, 1948.
Appointed 1967.

Dubois, Thomas E.
Clinical Psychologist, Counseling and Testing Center, Assistant Professor of Psychology
B.A., Grinnell College, 1960; M.S., Iowa State University, 1962; PH.D., State University of New York at Buffalo, 1968.
Appointed 1966.

Duncan, Lillian R.
Public Service Librarian; Associate Professor
B.A., University of Oklahoma, 1933.
Appointed 1934.

†Dunlop, William R.
Professor of Poultry Science
D.V.M., V.S., Ontario Veterinary College, 1938. Appointed 1950.

†Dunn, Gerald M.
Professor of Agronomy
B.S., West Virginia University, 1948; M.S., Purdue University, 1950; PH.D., *ibid.*, 1951. Appointed 1951.

†Dunn, Stuart
Professor of Botany
B.S., University of Minnesota, 1923; M.S., Iowa State College, 1925; PH.D., University of Minnesota, 1931.
Appointed 1926.

Durgin, Owen B.
Associate Professor of Resource Economics
B.S., Gorham State Teachers College, 1946; M.A., University of New Hampshire, 1951.
Appointed 1950.

Durnall, Edward J.
Director of the University Extension Service, Director of the Summer Session, and Associate Professor of Education
B.S., Hofstra University, 1947; M.A., Colorado College, 1948; ED.M., Harvard University, 1952; ED.D., Oregon State University, 1953. Appointed 1966.

Durost, Walter N.
Adjunct Professor of Education
A.B., Bates College, 1929; M.A., Teachers College, Columbia University, 1930; PH.D., *ibid.*, 1932. Appointed 1964.

Dusek, Rudolph V.
Instructor in Philosophy
B.A., Yale University, 1963.
Appointed 1966.

Dwyer, Jayne Elizabeth
Instructor in The Arts
B.S., Massachusetts College of Art, 1954.
Appointed 1965.

Dysinger, Robert E.
Branch Librarian; Assistant Professor
A.B., Bowdoin College, 1946; M.A., University of Michigan, 1949; M.S. in L.S., University of the State of New York, 1955. Appointed 1962.

Edwards, John C.
Director of Theater and Associate Professor of Speech and Drama
B.S., Northwestern University, 1950; M.A., *ibid.*, 1952; PH.D., *ibid.*, 1963.
Appointed 1961.

Edwards, Ruth S.
Lecturer in Music
B.S., Northwestern University, 1949; M.M., *ibid.*, 1950. Appointed 1966.

†Eggert, Russell
Professor of Horticulture
B.S., Michigan State College, 1929; M.S., *ibid.*, 1939. Appointed 1942 to 1946, 1948.

Ellis, David W.
Associate, Office of the Academic Vice President and Associate Professor of Chemistry
A.B., Haverford College, 1958; PH.D., Massachusetts Institute of Technology, 1962. Appointed 1962.

Elwell, Albert R.
Assistant Professor of Education
B.A., University of Maine, 1960; M.A., Michigan State University, 1961; PH.D., *ibid.*, 1964. Appointed 1967.

Emery, Harvard B.
Assistant Professor of Graphics
Cert. in M.E., Lowell Institute, 1938. Appointed 1954.

Engalichev, Nicolas
Associate Professor of Resource Economics
B.S., S.U.N.Y., College of Forestry, Syracuse University, 1957; M.S., *ibid.*, 1960. Appointed 1963.

Erickson, Raymond L.
Professor of Psychology
B.A., University of Buffalo, 1951; M.A., University of California at Los Angeles, 1954; PH.D., *ibid.*, 1962. Appointed 1963.

Esch, Joan L.
Visiting Lecturer in The Arts
A.B., Radcliffe College, 1951; A.M., Boston University, 1968. Appointed 1968.

†Estes, George O.
Assistant Professor of Plant Science
B.S., University of Maine, 1958; M.S., *ibid.*, 1960. Appointed 1969.

Estes, James W.
Instructor in Mathematics
B.S., Saint Lawrence University, 1965; M.S., University of New Hampshire, 1967. Appointed 1967.

Ewert, William
Lecturer in Education
B.S., University of New Hampshire, 1965; M.ED., *ibid.*, 1966. Appointed 1968.

Faiman, Robert N.
Vice President for Research and Professor of Electrical Engineering
B.S.E.E., North Dakota State College, 1947; M.S.E.E., University of Washington, 1948; PH.D., Purdue University, 1956. Appointed 1959.

Fan, Stephen S. T.
Associate Professor of Chemical Engineering
B.S., Stanford University, 1957; M.S., *ibid.*, 1960; PH.D., *ibid.*, 1962. Appointed 1962.

Farnsworth, Kirk E.
Psychologist, Counseling and Testing Center and Lecturer in Psychology
B.S., Iowa State University, 1962; M.S., *ibid.*, 1966; PH.D., *ibid.*, 1968. Appointed 1968.

Fasanelli, James A.
Associate Professor of The Arts
A.B., State University of Iowa, 1951; A.M., Harvard University, 1958. Appointed 1960.

Fay, William M.
Space Science Lecturer for N.A.S.A.
B.S., State College at Boston, 1965; M.ED., *ibid.*, 1967. Appointed 1968.

Ferguson, Allan D.
Adjunct Professor of History
B.A., Yale University, 1947; M.A., *ibid.*, 1948; PH.D., *ibid.*, 1954. Appointed 1968.

Fernald, Mary Louise
Associate Professor of Nursing
B.S., University of New Hampshire, 1931; R.N., Children's Hospital School of Nursing 1935; M.A., Teachers College, Columbia University, 1947. Appointed 1964.

Fernald, Peter S.
Associate Professor of Psychology
A.B., Amherst College, 1958; M.S., Springfield College, 1959; PH.D., Purdue University, 1963. Appointed 1966.

Fisher, Lester A.
Instructor in English
B.A., University of Maine, 1966.
Appointed 1968.

Fogg, Marguerite F.
Assistant Professor of Nursing
Diploma, Pillsbury Hospital School, 1940; Certificate, Hague Hospital, 1945; B.S., Boston College, 1957; M.S., *ibid.*, 1960. Appointed 1967.

Ford, Joseph P.
Instructor in Political Science
B.A., University of New Hampshire, 1956; M.P.A., Harvard University, 1957.
Appointed 1959 to 1961, 1962.

Foret, John Emil
Assistant Professor of Zoology
A.B., University of New Hampshire, 1962; M.S., *ibid.*, 1963; A.M., Princeton University, 1965; PH.D., *ibid.*, 1966.
Appointed 1967.

Forster, Ernst O.
Instructor in Education and German
B.A., Middlebury College, 1963; M.A., *ibid.*, 1965. Appointed 1966.

Forsyth, G. Alfred
Assistant Professor of Psychology
A.B., Dickinson College, 1961; M.S., North Carolina State University, 1963; PH.D., Purdue University, 1967. Appointed 1967.

Forsyth, Peggy D.
Instructor in Psychology
B.S., Madison College, 1961; M.S., North Carolina State University, 1963; M.S., Purdue University, 1965. Appointed 1967.

Fort, Marron C.
Associate Professor of German
A.B., Princeton University, 1961; PH.D., University of Pennsylvania, 1965.
Appointed 1969.

Foss, Stephen D.
Research Associate in Computer and Biomathematics
B.S., University of New Hampshire, 1964; M.S., *ibid.*, 1965. Appointed 1966.

†Foster, Bennett B.
Assistant Professor of Forest Resources
B.S.F., Colorado State University, 1952; M.F., Oregon State University, 1957; PH.D., Duke University, 1966.
Appointed 1964.

†Fowler, Arnold K.
Assistant Professor of Animal Science
B.S., University of New Hampshire, 1958; M.S., University of Connecticut, 1960; PH.D., Ohio State University, 1963.
Appointed 1966.

Fox, Leslie A.
Assistant Professor of Psychology
B.S., University of Washington, 1963; PH.D., *ibid.*, 1968. Appointed 1968.

Franq, Edward N.
Assistant Professor of Zoology
B.S., University of Maryland, 1956; M.S., University of Idaho, 1962; PH.D., Pennsylvania State University, 1967.
Appointed 1965.

†Friek, George E.
Adjunct Professor of Resource Economics
B.S., University of Connecticut, 1943; M.S., *ibid.*, 1947. Appointed 1957.

Fried, Robert L.
Instructor in English
B.A., City College of New York, 1963.
Appointed 1968.

Frost, Albert D.
Professor of Electrical Engineering
B.S., Tufts College, 1944; A.M., Harvard University, 1947; SC.D., Massachusetts Institute of Technology, 1952.
Appointed 1957.

†Furman, Thomas E.
Associate Professor of Botany
B.S., Montana State College, 1952; PH.D., Washington State University, 1958.
Appointed 1967.

Gadon, Herman
Associate Professor of Business Administration
A.B., Dartmouth College, 1947; PH.D., Massachusetts Institute of Technology, 1953. Appointed 1964.

†Gaudette, Henri E.
Assistant Professor of Geology
B.A., University of New Hampshire, 1959; M.S., University of Illinois, 1962; PH.D., *ibid.*, 1963. Appointed 1965.

Gay, Paul E.
Lecturer in Music
M.B., New England Conservatory of Music, 1958; M.M., Boston University, 1964. Appointed 1966.

†Gee, Glendon W.
Assistant Professor of Soil and Water Science
B.S., Utah State University, 1961; PH.D., Washington State University, 1966. Appointed 1966.

Gehrhardt, Henry M.
Assistant Professor of Chemical Engineering
B.S., Pennsylvania State University, 1960; PH.D., Kansas State University, 1965. Appointed 1964.

Gerhard, Glen C.
Assistant Professor of Electrical Engineering
B.E.E., Syracuse University, 1956; M.S., Ohio State University, 1958; PH.D., *ibid.*, 1963. Appointed 1967.

Gile, Albert
Instructor in Soil, Water, and Construction Technology, Thompson School of Applied Science
B.S.A.E., University of New Hampshire, 1964. Appointed 1964.

Gilman, Paul A.
Associate Professor of Soil, Water, and Construction Technology, Thompson School of Applied Science
B.S., University of Vermont, 1938; M.S., Pennsylvania State University, 1951. Appointed 1945.

Gilmore, Robert C.
Associate Professor of History
A.B., University of Vermont, 1944; M.A., McGill University, 1947; M.A., Yale University, 1951; PH.D., *ibid.*, 1954. Appointed 1952.

Gilsdorf, William O.
Instructor in Speech and Drama
B.A., Baldwin Wallace College, 1959; M.A., Bowling Green State University, 1960. Appointed 1965.

Glanz, Filson H.
Assistant Professor of Electrical Engineering
B.S., Stanford University, 1956; M.S., *ibid.*, 1957; PH.D., *ibid.*, 1965. Appointed 1965.

Goffe, Lewis C.
Associate Professor of English
B.S., University of New Hampshire, 1935; M.A., *ibid.*, 1946; PH.D., Boston University, 1961. Appointed 1946.

Goodman, Earl O., Jr.
Associate Professor of Home Economics
A.B., Baylor University, 1953; B.D., Southern Baptist Seminary, 1957; ED.D., Teachers College, Columbia University, 1962. Appointed 1963.

Goodrich, Robert W.
Assistant Professor of Electrical Engineering
B.S.E.E., University of New Hampshire, 1957; M.S.E.E., Purdue University, 1958. Appointed 1959.

Granger, Ralph H.
Associate Professor of Commerce Technology, Thompson School of Applied Science
B.S., Massachusetts State College, 1935; M.S., *ibid.*, 1939. Appointed 1946.

Grant, Clarence L.
Research Professor, Engineering Experiment Station and Adjunct Professor of Chemistry
B.S., University of New Hampshire, 1951; M.S., *ibid.*, 1956; PH.D., Rutgers University, 1960. Appointed 1952 to 1958, 1961.

Grant, Ruth H.
Senior Cataloger; Assistant Professor
S.B., Simmons College, 1932.
Appointed 1965.

Gray, Daniel
Adjunct Associate Professor, Whittemore School of Business and Economics
A.B., Hobart College, 1941; M.A., University of Buffalo, 1951; PH.D., Massachusetts Institute of Technology, 1958.
Appointed 1968.

†Green, Donald M.
Professor of Biochemistry
A.B., Oberlin College, 1954; PH.D., University of Rochester, 1958.
Appointed 1967.

Greenleaf, William
Professor of History
B.S.S., The City College, New York, 1942; M.A., Columbia University, 1948; PH.D., *ibid.*, 1955. Appointed 1958.

Griewank, George
Instructor in English and Education
M.A., University of Chicago, 1956.
Appointed 1966.

Griewank, Virginia W.
Instructor in Home Economics
B.S., Hood College, 1938. Appointed 1967.

Grishman, Alan
Associate Professor of Music
B.S., Mannes College of Music, 1965; M.A., New York University, 1967.
Appointed 1967.

Guay, Merle D.
Assistant Professor of Mathematics
B.S., Maine Maritime Academy, 1954; B.S., Tufts University, 1958; M.A., University of Maine, 1960; PH.D., Michigan State University, 1967. Appointed 1965.

Haaland, Gordon A.
Assistant Professor of Psychology
A.B., Wheaton College, 1962; PH.D., State University of New York at Buffalo, 1966.
Appointed 1965.

Haendler, Helmut M.
Professor of Chemistry
B.S., Northeastern University, 1935; PH.D., University of Washington, 1940.
Appointed 1945.

Hagstrom, Earl C.
Associate Professor of Psychology
B.S., Tufts University, 1952; M.S., Brown University, 1954; PH.D., *ibid.*, 1957.
Appointed 1965.

†Hall, Francis R.
Associate Professor of Soil and Water Science, Thompson School of Applied Science
B.S., Stanford University, 1949; M.A., University of California at Los Angeles, 1953; PH.D., Stanford University, 1961.
Appointed 1964.

Hall, Harry H.
Professor of Physics
B.S., Union College, 1926; PH.D., Harvard University, 1934. Appointed 1940.

Hall, Helen P.
Lecturer in Home Economics
B.S., Kansas State University, 1941; M.N.S., Cornell University, 1949; PH.D., *ibid.*, 1953. Appointed 1968.

***†Hall, Otis F.**
Professor of Forest Resources
A.B., Oberlin College, 1943; M.F., Yale University, 1948; PH.D., University of Minnesota, 1954. Appointed 1968.

Hamilton, David A.
Project Director in Education
B.ED., Plymouth State College, 1966.
Appointed 1968.

Hamlin, Robert N.
Instructor in Mechanical Engineering
B.S., University of New Hampshire, 1968; M.S., University of Rhode Island, 1968.
Appointed 1968.

Handy, Allan W., M.D.
Lecturer in Zoology
B.S., Tufts College, 1934; M.D., Tufts Medical School, 1938. Appointed 1965.

Hanrahan, Edward J.
Instructor in English
B.A., University of New Hampshire, 1961.
Appointed 1966.

Hanrahan, Joyce Y.
Instructor in Education
B.A., University of Alabama, 1955; M.ED., University of New Hampshire, 1964; M.ED., *ibid.*, 1968. Appointed 1968.

Hansen, Flemming
Visiting Associate Professor of Business Administration
B.A., Copenhagen School of Business, 1960; M.B.A., *ibid.*, 1962; PH.D., *ibid.*, 1967. Appointed 1967.

Hapgood, Robert D.
Associate Professor of English
B.A., University of California, 1950; M.A., *ibid.*, 1951; PH.D., *ibid.*, 1955.
Appointed 1965.

Hardy, Hubert A.
Psychologist, Counseling and Testing Service and Instructor in Education
A.A., San Diego Junior College, 1954; A.B., George Washington University, 1958; M.A., *ibid.*, 1963; PH.D., University of Oklahoma, 1966. Appointed 1968.

Haskell, John R.
Assistant to the Dean, Whittemore School of Business and Economics and Instructor in Economics
B.A., University of New Hampshire, 1963; M.A., *ibid.*, 1965. Appointed 1965.

Haslerud, George M.
Professor of Psychology
B.A., University of Minnesota, 1930; PH.D., *ibid.*, 1934. Appointed 1945.

Hatch, John W.
Professor of The Arts
Diploma, Massachusetts School of Art, 1941; B.F.A., Yale University School of the Fine Arts, 1948; M.F.A., *ibid.*, 1949. Appointed 1949.

Haubrich, F. William
Coach of Basketball and Assistant Professor of Physical Education
B.A., University of New Hampshire, 1952.
Appointed 1962.

Hebert, David J.
Assistant Professor of Education
B.S., University of Maine, 1962; M.ED., Duquesne University, 1964; PH.D., Kent State University, 1967. Appointed 1967.

Heilbronner, Hans
Professor of History
A.B., University of Michigan, 1949; A.M., *ibid.*, 1950; PH.D., *ibid.*, 1954.
Appointed 1954.

Heisey, Daniel
Adjunct Assistant Professor of Mathematics and Education
B.S., Loyola College, 1958; M.A.T., Johns Hopkins University, 1959.
Appointed 1965.

Held, Warren H., Jr.
Associate Dean of the College of Liberal Arts and Professor of Classics
B.A., Princeton University, 1950; M.A., Yale University, 1952; PH.D., *ibid.*, 1955.
Appointed 1967.

†Henry, William F.
Professor of Resource Economics
B.S., Louisiana State University, 1940; M.S., University of Connecticut, 1942.
Appointed 1952.

Hepler, Elizabeth M.
Serials Librarian; Assistant Professor
A.B., University of Michigan, 1944; M.S., Southern Connecticut State College, 1968. Appointed 1966.

†Herbst, Edward J.
Professor of Biochemistry
B.S., University of Wisconsin, 1942; M.S., *ibid.*, 1944; PH.D., *ibid.*, 1949.
Appointed 1962.

Herr, Guenter K. W.
Assistant Professor of German
Abitur, Gymasium, Goettingen, Germany, 1951; M.A., University of Freiburg, Germany, 1956; PH.D., University of Texas, 1966. Appointed 1968.

Hess, Irvin T.
Coach of Wrestling and Instructor in Physical Education
B.S., State College, Pennsylvania, 1950; M.S., University of Massachusetts, 1966. Appointed 1966.

Hettinger, Stanley D.
Assistant Professor of Music
B.M., Ohio State University, 1955; M.M.E., VanderCook College, 1966. Appointed 1965.

Hewitt, Virginia L.
Research Associate, Computation Center
B.S., Mary Washington College, 1966. Appointed 1968.

Hickson, Fred T.
Assistant Professor of Microbiology
A.B., Indiana University, 1954; M.A., *ibid.*, 1961; PH.D., Michigan State University, 1965. Appointed 1968.

Higbie, Paul R.
Research Associate in Physics
B.A., University of Connecticut, 1958; PH.D., Massachusetts Institute of Technology, 1968. Appointed 1968.

***†Higgins, Leroy J.**
Associate Professor of Agronomy
B.S., University of New Hampshire, 1923. Appointed 1927 to 1928, 1929.

†Hill, John L.
Associate Professor of Forest Resources
B.S., Colorado State University, 1942; M.S., Yale University, 1947; D.F., *ibid.*, 1954. Appointed 1964.

Hiltunen, Elizabeth
Instructor in Nursing
B.S., Columbia University, 1959. Appointed 1967.

Hochgraf, Frederick G.
Associate Professor of Materials Science
B.MET.E., Rensselaer Polytechnic Institute, 1954; M.S., Cornell University, 1958. Appointed 1958.

†Hocker, Harold W., Jr.
Associate Professor of Forest Resources
B.S.F., Pennsylvania State College, 1949; M.F., North Carolina State College, 1952; D.F., Duke University, 1955. Appointed 1955.

†Hodgdon, Albion R.
Professor of Botany
B.S., University of New Hampshire, 1930; M.S., *ibid.*, 1932; PH.D., Harvard University, 1936. Appointed 1930 to 1932, 1936.

Hoeh, Roger S.
Research Associate in Political Science
B.A., University of New Hampshire, 1964; M.A., University of Delaware, 1966. Appointed 1967.

Hoff, Phyllis
Assistant Professor of Physical Education
B.S., University of Texas, 1957; M.S., Smith College, 1960; PH.D., University of Southern California, 1967. Appointed 1967.

Hogan, John A.
Carter Professor of Economics
A.B., University of Washington, 1932; A.M., *ibid.*, 1934; M.A., Harvard University, 1948; PH.D., *ibid.*, 1952. Appointed 1947.

Hogarth, Karen
Assistant Professor of Physical Education
A.A., Cottey College, 1954; B.S., Oregon State University, 1959; M.A., University of Wisconsin, 1963. Appointed 1967.

***Hoitt, Samuel W.**
Director of the Cooperative Extension Service and Professor of Agricultural Education
B.S., University of New Hampshire, 1928; M.S., *ibid.*, 1931. Appointed 1929.

Holden, John T.
Professor of Political Science
A.B., Wesleyan University, 1936; M.P.A., Harvard University, 1941; M.A., *ibid.*, 1942; PH.D., *ibid.*, 1943. Appointed 1947.

Holder, Mary E.
Associate Professor of Home Economics
Teaching Diploma, Nova Scotia Provincial Normal College, 1935; B.S., Mount Allison University, 1939; M.S., Michigan State University, 1949. Appointed 1967.

Hollingsworth, Helen
Instructor in English
B.A., University of Alabama, 1959; M.A., *ibid.*, 1959. Appointed 1966.

Holt, Charles E., Jr.
Coach, Varsity Hockey and Golf, Lecturer in Physical Education
B.A., Dartmouth College, 1946. Appointed 1968.

†Holter, James B.
Associate Professor of Dairy Science
B.S., Pennsylvania State University, 1956; M.S., University of Maryland, 1958; PH.D., Pennsylvania State University, 1962. Appointed 1963.

Hoornbeek, Frank K.
Associate Professor of Zoology
B.S., Colorado A & M, 1952; M.S., Oregon State University, 1962; PH.D., *ibid.*, 1964. Appointed 1964.

Horrigan, James O.
Associate Professor of Business Administration
B.S.C., University of Notre Dame, 1952; M.B.A., University of Chicago, 1956; PH.D., *ibid.*, 1967. Appointed 1966.

Hosek, William R.
Assistant Professor of Economics
B.A., University of California, 1964; PH.D., *ibid.*, 1967. Appointed 1967.

Hou, Roger Hsiang-Dah
Assistant Professor of Mathematics
B.A., Chung Chi College, 1957; PH.D., Indiana University, 1965. Appointed 1965.

Houston, Robert E., Jr.
Professor of Physics
B.S., Michigan State University, 1949; M.S., *ibid.*, 1951; PH.D., Pennsylvania State University, 1957. Appointed 1957.

Howarth, Charles H.
Director of the University Health Service
B.S., Bates College, 1943; M.D., Tufts Medical School, 1946. Appointed 1955.

Hraba, John B.
Dean, Office of Institutional Research and Planning and Professor of Electrical Engineering
B.S., University of New Hampshire, 1948; M.ENG., Yale University, 1949; PH.D., University of Illinois, 1955. Appointed 1949.

Hub, Ladislav
Research Associate in Chemistry
Inzenyr Chemie, Bysoka Skola Chemickotechnologicka (Prague), 1963; Kandidat Chemickych Ved, *ibid.*, 1968. Appointed 1969.

Hubbard, Colin
Assistant Professor of Chemistry
B.S., University of Sheffield, 1961; PH.D., *ibid.*, 1964. Appointed 1967.

Hudon, Edna S.
Visiting Associate Professor of French
B.A., Bryn Mawr College, 1942; PH.D., Yale University, 1955. Appointed 1961.

Hudon, Louis J.
Professor of French
A.B., Bowdoin College, 1938; M.A., Yale University, 1942; PH.D., *ibid.*, 1943. Appointed 1961.

Hull, John J.
Assistant Order Librarian; Instructor
B.A., University of New Hampshire, 1947; M.ED., *ibid.*, 1968. Appointed 1967.

Hunter, Robin S.
Instructor in Political Science
B.A., University of Alberta, 1964; M.A., Indiana University, 1967. Appointed 1968.

Hunter, William B., Jr.
Professor of English
A.B., Princeton University, 1937; M.A., Vanderbilt University, 1939; PH.D., *ibid.*, 1946. Appointed 1968.

Hunziker, Nancy
Lecturer in Music
B.M.E., Gustavus Adolphus College, 1961; M.M., New England Conservatory of Music, 1968. Appointed 1968.

Ihre, Diane M.
Assistant Professor of Nursing
B.S., Teachers College, Columbia University, 1962; M.S., New York University, 1968. Appointed 1968.

†Ikawa, Miyoshi
Professor of Biochemistry
B.S., California Institute of Technology, 1941; M.S., University of Wisconsin, 1944; PH.D., *ibid.*, 1948. Appointed 1963.

Indrisano, Roselimina M.
Associate Professor of Education
B.A., Emmanuel College, 1952; M.ED., Boston University, 1956; D.ED., *ibid.*, 1963. Appointed 1963.

Ingersoll, Richard L.
Assistant Professor of Sociology
B.S., B.A., Central Michigan University, 1958; M.A., State University of Iowa, 1961; PH.D., *ibid.*, 1965. Appointed 1965.

Irwin, Isabel A.
Instructor in Spanish
B.S., University of Vermont, 1948; M.A., University of New Hampshire, 1968. Appointed 1967.

Irwin, Manley R.
Associate Professor of Economics
A.B., Michigan State College, 1950; M.A., University of Michigan, 1954; PH.D., Michigan State University, 1963. Appointed 1963.

Jacoby, Robb
Professor of Mathematics
S.B., University of Chicago, 1941; S.M., *ibid.*, 1942; PH.D., *ibid.*, 1946. Appointed 1961.

Jaffe, Erwin A.
Associate Professor of Political Science
B.A., Rutgers University, 1949; M.A., *ibid.*, 1958; PH.D., *ibid.*, 1961. Appointed 1963.

***James, Jesse**
State Leader, 4-H Youth Development, Cooperative Extension Service and Associate Professor of Agricultural Education
B.S., University of Georgia, 1937; M.S., *ibid.*, 1951. Appointed 1957.

James, Marion E.
Associate Professor of History
B.A., University of New Hampshire, 1940; M.A., Radcliffe College, 1949; PH.D., *ibid.*, 1955. Appointed 1955.

***†Jansen, Edmund F., Jr.**
Associate Professor of Resource Economics
B.S., University of Illinois, 1960; M.S., North Carolina State University, 1964; PH.D., *ibid.*, 1966. Appointed 1969.

Jellison, Charles A., Jr.
Associate Professor of History
A.B., Stanford University, 1944; M.A., *ibid.*, 1948; PH.D., University of Virginia, 1956. Appointed 1956.

Jenkins, Melvin E., Jr.
Associate Professor of Forest Technology, Thompson School of Applied Science
B.S.F., University of Massachusetts, 1959; M.S.F., University of New Hampshire, 1961. Appointed 1961.

Jenkins, Robert W.
Research Associate, Space Science Center and Instructor in Physics
B.S., University of British Columbia, 1960; M.S., University of Alberta, 1961; PH.D., *ibid.*, 1966. Appointed 1965.

Jenks, R. Stephen
Assistant Professor of Business Administration
B.A., College of Wooster, 1961; M.S., Case Institute, 1963; PH.D., *ibid.*, 1966. Appointed 1967.

Jervis, Frederick M.
Professor of Psychology
B.A., University of New Hampshire, 1948; M.A., *ibid.*, 1949; PH.D., Columbia University, 1958. Appointed 1952.

Johnson, Richard E.
Professor of Mathematics
B.A., Intermountain Union College, 1934; M.A., Brown University, 1939; PH.D., University of Wisconsin, 1941.
Appointed 1966.

Johnson, W. Scott
Instructor in Spanish
A.B., Temple University, 1960; A.M., University of Pennsylvania, 1963.
Appointed 1965.

Jones, Galen E.
Professor of Microbiology and Director of the Estuarine Laboratory
B.A., Dartmouth College, 1950; M.A., Williams College, 1952; PH.D., Rutgers University, 1956. Appointed 1966.

Jones, Judith B.
Instructor in Physical Education
B.S., University of New Hampshire, 1960.
Appointed 1967.

Jones, Meredyth M.
Lecturer in Music
B.M., University of Michigan, 1955; M.M., *ibid.*, 1956. Appointed 1966.

Jones, Paul R.
Professor of Chemistry
B.A., Albion College, 1952; PH.D., University of Illinois, 1956. Appointed 1956.

Jones, William R.
Associate Professor of History
A.B., Harvard University, 1951; M.A., *ibid.*, 1952; PH.D., *ibid.*, 1958.
Appointed 1962.

Kaplan, Barry D.
Instructor in Hotel Administration
B.S., University of New Hampshire, 1963; M.B.A., Michigan State University, 1964.
Appointed 1967.

Kase, Judith B.
Instructor in Speech and Drama
B.A., University of Delaware, 1955; M.A., Western Reserve University, 1956.
Appointed 1963.

Kaufmann, Richard Leo
Associate Professor of Physics
B.S., California Institute of Technology, 1957; M.S., Yale University, 1958; PH.D., *ibid.*, 1960. Appointed 1963.

Kauppinen, Tenho S.
Assistant Dean of the College of Technology and Associate Professor of Mechanical Engineering
B.S., University of New Hampshire, 1939; M.S., *ibid.*, 1947. Appointed 1939.

***†Keener, Harry A.**
Dean of the College of Agriculture, Director of the Agricultural Experiment Station, and Professor of Dairy Science
B.S., Pennsylvania State College, 1936; M.S., West Virginia University, 1938; PH.D., Pennsylvania State College, 1941.
Appointed 1941.

Keesey, C. Robert
Dean of Students
B.A., Oberlin College, 1948.
Appointed 1960.

Kelley, Ann B.
Assistant Professor of Nursing
Diploma, Peter Bent Brigham Hospital, 1955; B.S., Boston University, 1959; M.S., *ibid.*, 1966. Appointed 1965.

Kennedy, Robert C.
Associate Professor of Applied Plant Science, Thompson School of Applied Science
B.V.A., Massachusetts State College, 1940; M.S., University of New Hampshire, 1961.
Appointed 1941.

Kenney, John F.
Captain, USAF, Assistant Professor of Aerospace Studies
B.S., State College at Boston, 1961; M.A., Suffolk University, 1962. Appointed 1967.

Kertzer, Joyce
Instructor in Physical Education for Women
B.S., Brockport State College, 1960; M.A., Michigan State University, 1962.
Appointed 1968.

Kertzer, Robert
Assistant Professor of Physical Education
B.S., Brooklyn College, 1960; M.S., University of Illinois, 1961; PH.D., Michigan State University, 1965. Appointed 1965.

Khleif, Bud
Associate Professor of Education and Sociology
Certificate, Government Arab College, Jerusalem, 1948; B.A., Hebrew University, 1952; M.A., University of Michigan, 1954; PH.D., Johns Hopkins University, 1957.
Appointed 1967.

Kichline, William L.
Professor of Mathematics
B.A., Lehigh University, 1924; M.S., *ibid.*, 1928. Appointed 1931.

Kilbreth, Harold E.
Adjunct Instructor in Chemistry and Education
B.S., University of Maine, 1951; M.S., University of New Hampshire, 1965.
Appointed 1966.

Kimball, Robert O.
Assistant Professor of Mathematics
B.S., University of New Hampshire, 1941; M.A., *ibid.*, 1952. Appointed 1946.

Kimball, Roland B.
Professor of Education
B.S., University of New Hampshire, 1942; M.ED., *ibid.*, 1949; ED.D., Harvard School of Education, 1958. Appointed 1963.

King, Janice C.
Instructor in Mathematics
B.A., Chatham College, 1960.
Appointed 1967.

Klein, Mark P.
Assistant Professor of Physics
A.B., University of Pennsylvania, 1955; M.S., Indiana University, 1960; PH.D., *ibid.*, 1965. Appointed 1965.

Klinger, Burton I.
Assistant Professor of Psychology
B.A., Hobart College, 1959; M.S., Pennsylvania State University, 1961; PH.D., *ibid.*, 1966. Appointed 1967.

†Klippenstein, Gerald L.
Assistant Professor of Biochemistry
B.S., Wheaton College, 1962; PH.D., Northwestern University, 1966. Appointed 1966.

Klotz, Louis H.
Assistant Professor of Civil Engineering
B.S.C.E., Pennsylvania State University, 1951; M.C.E., New York University, 1952; PH.D., Rutgers University, 1967.
Appointed 1965.

Knowlton, Elizabeth E.
Assistant Professor of Physical Education
B.A., Syracuse University, 1959.
Appointed 1963.

Korbel, John
Professor of Economics and Business
S.B., Harvard College, 1939; M.B.A., Harvard Business School, 1941; PH.D., Harvard University, 1959. Appointed 1966.

Kuo, Shan S.
Professor of Applied Mathematics
B.S., National Chung Chen University, 1944; M.S., Ohio State University, 1948; M.E., Harvard University, 1954; D.ENG., Yale University, 1958. Appointed 1964.

Ladd, Dwight R.
Professor of Business Administration
A.B., Brown University, 1943; M.B.A., Harvard University, 1949; D.B.A., *ibid.*, 1956. Appointed 1964.

Lambelin, Genevieve J.
Visiting Professor of French
Baccalaureat, Besancon University, 1949; Certificate, Strasbourg University, 1950, 52, 53, 53, 53; C.A.P.E.S., Paris, 1957; C.A.P.E.S., Epreuves pratiques; C.P.R., Besancon, 1958. Appointed 1968.

Lambert, Robert H.
Professor of Physics
B.S., St. Lawrence University, 1952; M.S., Harvard University, 1954; PH.D., *ibid.*, 1963. Appointed 1961.

***†Langer, Clarence A.**
Professor of Horticulture
B.S., Michigan State University, 1933; M.S., *ibid.*, 1948; PH.D., *ibid.*, 1952.
Appointed 1962.

Langley, Harold E., Jr.
Associate Professor of Civil Engineering
B.S., University of New Hampshire, 1949; S.M., Massachusetts Institute of Technology, 1955; M.S., University of New Hampshire, 1956; SC.D., Massachusetts Institute of Technology, 1957.
Appointed 1961.

Larson, David L.
Associate Professor of Political Science
A.B., Dartmouth, 1952; A.M., Fletcher School, Tufts University, 1957; M.A.L.D., *ibid.*, 1958; PH.D., *ibid.*, 1963.
Appointed 1965.

Laurent, John L.
Associate Professor of The Arts
B.F.A., Syracuse University, 1948; M.A.T., Indiana University, 1954. Appointed 1954.

Lavoie, Marcel E.
Associate Professor of Zoology
B.A., St. Anselm's College, 1940; M.A., University of New Hampshire, 1950; PH.D., Syracuse University, 1956.
Appointed 1950 to 1952, 1955.

Leahy, John A.
Instructor in Applied Plant Sciences, Thompson School of Applied Science
B.S., University of New Hampshire, 1947.
Appointed 1966.

Leak, William B.
Adjunct Assistant Professor of Forest Resources
B.S., S.U.N.Y., College of Forestry, Syracuse University, 1953; M.F., *ibid.*, 1956.
Appointed 1967.

LeBlanc, Robert G.
Assistant Professor of Geography
B.A., University of New Hampshire, 1959; M.A., University of Minnesota, 1962; PH.D., *ibid.*, 1968. Appointed 1963.

Legedza, Roman
Instructor in Russian
B.A., Rutgers University, 1957; M.A., *ibid.*, 1959. Appointed 1967.

Leighton, Charles H.
Associate Professor of Spanish
A.B., Harvard College, 1951; A.M. Harvard University, 1953; PH.D., *ibid.*, 1961.
Appointed 1956.

Lenoe, Edward M.
Lecturer in Civil Engineering
A.B., Columbia College, 1957; B.S., Columbia University School of Engineering, 1958; M.S.C.E., *ibid.*, 1959; D.ENG.SC., *ibid.*, 1964. Appointed 1968.

Lentz, Jacob B.
Instructor in History
A.B., Wabash College, 1962; M.A., Harvard University, 1963. Appointed 1967.

LeRay, Nelson L., Jr.
Adjunct Associate Professor of Resource Economics
B.S., Louisiana State University, 1952; M.A., *ibid.*, 1953; ED.D., Cornell University, 1965. Appointed 1966.

Lesh, Lona M.
Instructor in Physical Education for Women
B.S., Slippery Rock State College, 1965; M.S., University of Massachusetts, 1968.
Appointed 1968.

Lewis, Ronald W.
Adjunct Instructor in French
A.B., Dartmouth College, 1965; M.A.T., Harvard University, 1967.
Appointed 1967.

Linden, Allen B.
Assistant Professor of History
B.A., Wayne State University, 1957; M.A., Columbia University, 1960.
Appointed 1963.

Linsky, Arnold S.
Assistant Professor of Sociology
A.B., Dartmouth College, 1954; M.A., University of Washington, 1963; PH.D., *ibid.*, 1966. Appointed 1966.

Littlefield, Karen A.
Cataloger; Assistant Professor
B.A., University of New Hampshire, 1963; M.S., Simmons College, 1965.
Appointed 1964.

Lockwood, John A.
Professor of Physics
A.B., Dartmouth College, Thayer School of Engineering, 1941; M.S., Lafayette College, 1943; PH.D., Yale University, 1948.
Appointed 1948.

Logan, Terence P.
Assistant Professor of English
A.B., Boston College, 1959; M.A., University of Wisconsin, 1961; PH.D., Harvard University, 1966. Appointed 1968.

Long, David F.
Professor of History
A.B., Dartmouth College, 1939; A.M., Columbia University, 1946; PH.D., *ibid.*, 1950. Appointed 1948.

Loughlin, John R.
Instructor in Education
B.E., Keene State College, 1958; M.ED., University of New Hampshire, 1968.
Appointed 1968.

†Loy, James B.
Assistant Professor of Plant Science
B.S., Oklahoma State University, 1963; M.S., Colorado State University, 1965; PH.D., *ibid.*, 1967. Appointed 1967.

Lucian, Sandra F.
Lecturer in Music
M.S., University of New Hampshire, 1964.
Appointed 1966.

Lyle, Gloria G.
Associate Professor of Chemistry
B.A., Vanderbilt University, 1944; M.S., Emory University, 1946; PH.D., University of New Hampshire, 1958.
Appointed 1951.

Lyle, Robert E., Jr.
Professor of Chemistry
B.A., Emory University, 1945; M.S., *ibid.*, 1946; PH.D., University of Wisconsin, 1949.
Appointed 1951.

MacLeod, Christopher D.
Instructor in English
B.A., University of New Hampshire, 1965; M.A., *ibid.*, 1967. Appointed 1967.

Margulies, Julius
Adjunct Instructor in History and Instructor in Education
B.A., Brandeis University, 1959; M.ED., Northeastern University, 1964.
Appointed 1968.

Marple, Sylvia H.
Assistant Professor of Home Economics
B.S., Winthrop College, 1963; M.S., *ibid.*, 1964. Appointed 1964.

Marschner, Donald C.
Associate Professor of Business Administration
B.A., Brown University, 1929; PH.D., Columbia University, 1964. Appointed 1964.

Marshall, Grover E.
Assistant Professor of French and Italian
A.B., Bowdoin College, 1951; M.A., Princeton University, 1954. Appointed 1965.

Marshall, Thomas O.
Professor of Education
A.B., Colgate University, 1929; ED.M., University of Buffalo, 1933; ED.D., Harvard University, 1941. Appointed 1947.

Martin, Mason E.
Major, USA, Assistant Professor of Military Science
B.S., Norwich University, 1957.
Appointed 1967.

Matheson, Raymond E.
Instructor in Political Science, Foreign Student Adviser and Director of Cultural Events
B.A., University of New Hampshire, 1953; M.A., *ibid.*, 1963. Appointed 1963.

Mathieson, Arthur C.
Assistant Professor of Botany
B.A., University of California, 1960; M.A., *ibid.*, 1961; PH.D., University of British Columbia, 1965. Appointed 1965.

Maynard, Max S.
Associate Professor of English
B.A., University of British Columbia, 1937. Appointed 1946.

McConnell, John W.
President
B.A., Dickinson College, 1929; PH.D., Yale University, 1937. Appointed 1963.

McDonald, Robert A., Jr.
Instructor in Speech and Drama
B.A., Fairfield University, 1965; M.F.A., Yale University School of Drama, 1968. Appointed 1968.

***†McFadden, Lorne A.**
Associate Professor of Horticulture
Diploma, Nova Scotia Agricultural College, 1947; B.S., McGill University, 1949; M.S., Cornell University, 1953; PH.D., *ibid.*, 1956. Appointed 1963.

McQuade, Elizabeth A.
Associate Dean of Students
A.B., The State University of Iowa, 1950; A.M., University of Chicago, 1955. Appointed 1960.

Mead, Jean M.
Instructor in Physical Education
Degree, University of Liverpool, 1955. Appointed 1967.

Meagher, Judith A.
Assistant Professor of Education
B.S., Salem Teachers College, 1960; M.ED., Boston University, 1962; ED.D., *ibid.*, 1968. Appointed 1968.

Melvin, Donald W.
Associate Professor of Electrical Engineering
B.S., University of New Hampshire, 1955; M.E., Yale University, 1957. Appointed 1957.

Menge, Carleton P.
Professor of Education
B.S., Springfield College, 1939; M.A., University of Chicago, 1940; PH.D., *ibid.*, 1948. Appointed 1948.

Merritt, Richard D.
Associate Professor of The Arts and University Photographer
Certificate, Rochester Institute of Technology, 1948. Appointed 1948.

Metcalf, Theodore G.
Professor of Microbiology
B.S., Massachusetts College of Pharmacy, 1940; PH.D., University of Kansas, 1950. Appointed 1956.

Meyers, T. Ralph
Professor of Geology
B.A., Ohio State University, 1926; M.A., *ibid.*, 1929. Appointed 1927.

Michael, Joseph E., Jr.
Lecturer in Business Administration
A.B., Dartmouth College, 1948; LL.B., Boston University School of Law, 1950. Appointed 1960.

Miller, Edmund G.
Associate Professor of English
A.B., Dartmouth College, 1943; M.A., Columbia University, 1947; PH.D., *ibid.*, 1955. Appointed 1951.

Mills, Betty J.
Assistant Professor of Physical Education
B.S., Georgia State College for Women, 1949; M.S., University of Tennessee, 1958. Appointed 1967.

Mills, Eugene S.
Dean of the College of Liberal Arts and Professor of Psychology
B.A., Earlham College, 1948; M.A., Claremont Graduate School, 1949; PH.D., *ibid.*, 1952. Appointed 1962.

Mills, Richard L.
Assistant Professor of Business and Economics and Assistant Dean of the Whittemore School of Business and Economics
B.S., Rose Polytechnic Institute, 1962; M.A., Indiana University, 1964; PH.D., *ibid.*, 1967. Appointed 1967.

Milne, Lorus J.
Professor of Zoology
B.A., University of Toronto, 1933; M.A., Harvard University, 1934; PH.D., *ibid.*, 1936. Appointed 1948.

Milne, Margery
Lecturer in Physical Education
A.B., Hunter College, 1933; M.A., Columbia College, 1936; M.A., Radcliffe College, 1936; PH.D., *ibid.*, 1939. Appointed 1965.

***Mitchell, James R.**
Assistant Professor of Agronomy
B.S., University of New Hampshire, 1957; M.S., Pennsylvania State University, 1960. Appointed 1963.

Moak, Peter V.
Assistant Professor of The Arts
B.A., Williams College, 1958; A.M., New York University, 1961. Appointed 1968.

Mooradian, Andrew T.
Director, Department of Intercollegiate Athletics, and Associate Professor of Physical Education
B.S., University of New Hampshire, 1948; M.S., Boston University, 1958. Appointed 1950.

Moore, Asher
Donald C. Babcock Professor of Philosophy
A.B., Wesleyan University, 1940; M.A., Harvard University, 1942; PH.D., *ibid.*, 1948. Appointed 1961.

Moore, Francis E.
Lecturer in Business Administration
B.B.A., Boston University, 1923. Appointed 1964.

***Moore, Herbert C.**
Associate Professor of Dairy Science
B.S., Purdue University, 1923, M.S., University of Minnesota, 1925. Appointed 1928.

Morin, Robert R.
Coordinator-Instructor, Cooperative Library Service
B.A., University of New Hampshire, 1963; M.S., Simmons College, 1965. Appointed 1965.

Morrison, James D.
Assistant Professor of Chemistry
B.S., Franklin and Marshall College, 1958; PH.D., Northwestern University, 1963. Appointed 1965.

Morrison, Jean M.
Assistant Professor of Physical Education
B.A., University of Kentucky, 1956; M.A., Mills College, 1962. Appointed 1965

Mosberg, William
Associate Professor of Mechanical Engineering
B.S.M.E., Columbia University, 1956; M.ENG., Yale University, 1960. Appointed 1958.

Moses, Ruth E.
Assistant Order Librarian; Assistant Professor
A.B., Bates College, 1927; B.L.S., School of Library Science, Columbia University, 1930; A.M., Teachers College, Columbia University, 1943. Appointed 1957.

Mower, Lyman
Professor of Physics
B.S., University of California, 1949; PH.D., Massachusetts Institute of Technology, 1953. Appointed 1957.

Mulhern, John E.
Professor of Physics
B.S., Oklahoma Agricultural and Mechanical College, 1948; M.A., Boston University, 1949; PH.D., *ibid.*, 1954. Appointed 1954.

Mullen, George H.
Assistant Professor of Physics
B.A., Rutgers State University, 1956; M.S., Syracuse University, 1958; PH.D., *ibid.*, 1961. Appointed 1963.

Munroe, M. Evans
Professor of Mathematics
B.A., University of Texas, 1940; SC.M., Brown University, 1941; PH.D., *ibid.*, 1945. Appointed 1959.

Murdoch, Joseph B.
Professor of Electrical Engineering
B.S., Case Institute of Technology, 1950; M.S., University of New Hampshire, 1955; PH.D., Case Institute of Technology, 1962.
Appointed 1952.

Murray, Donald M.
Professor of English
B.A., University of New Hampshire, 1948.
Appointed 1963.

Murray, Frederick P.
Assistant Professor of Speech and Drama
B.A., Stanford University, 1948; M.A., University of Southern California, 1950; PH.D., Denver University, 1966.
Appointed 1966.

Myers, Norman W.
Vice President-Treasurer
B.S., University of New Hampshire, 1950.
Appointed 1953.

Nast, Charlotte G.
Professor of Botany
B.A., University of Wisconsin, 1927; M.A., *ibid.*, 1929; PH.D., University of California, 1938. Appointed 1948.

Newell, L. Jackson
Assistant to Dean, College of Liberal Arts
B.A., Ohio State University, 1961; M.A., Duke University, 1964. Appointed 1967.

Newman, Barbara K.
Associate Professor of Physical Education
B.S., Russell Sage College, 1939; M.ED., St. Lawrence University, 1948.
Appointed 1948.

***Nickerson, Dorothy A.**
Assistant Professor of Home Economics
Cert. B. of Architecture, Smith Graduate School of Architecture, 1940.
Appointed 1963.

Nicoloff, Philip L.
Associate Professor of English
B.A., University of California at Los Angeles, 1949; M.A., Columbia University, 1952; PH.D., ibid., 1959.
Appointed 1954.

Nielson, Melville
Associate Dean of the College of Liberal Arts and Associate Professor of Sociology
B.S., Bowling Green State University, 1942; M.A., Ohio State University, 1947; PH.D., *ibid.*, 1955. Appointed 1950.

Noonan, Catherine
Assistant Professor of Education
B.ED., Keene State College, 1952; M.A., Columbia Teachers College, 1957.
Appointed 1967.

Nordgren, Eric A.
Assistant Professor of Mathematics
B.CH.E., Polytechnic Institute of Brooklyn, 1956; PH.D., University of Michigan, 1964.
Appointed 1964.

Norris, Douglas M., Jr.
Associate Professor of Mechanical Engineering
B.S., Tufts University, 1951; ED.M., *ibid.*, 1955; PH.D., Michigan State University, 1962. Appointed 1962.

Northway, Philip E.
Assistant Professor of Education
A.B., Harvard, 1949; A.M.T., *ibid.*, 1951; M.A.L.S., Simmons College School of Library Science, 1961. Appointed 1965.

Nothmann, Gerhard S.
Consulting Psychiatrist
M.D., University of Bern, 1938.
Appointed 1952.

***†Nott, Sherrill B.**
Assistant Professor of Resource Economics
B.S., University of Vermont, 1962; M.S., Cornell University, 1963; PH.D., *ibid.*, 1968. Appointed 1968.

O'Connell, Lawrence W.
Assistant Professor of Political Science
B.A., University of New Hampshire, 1956; PH.D., Syracuse University, 1968.
Appointed 1966.

***O'Donnell, Dorothy C.**
Associate Professor of Home Economics
B.S., Cornell University, 1946; M.S., University of Wisconsin, 1952; M.S., *ibid.*, 1955. Appointed 1961.

†Olson, David P.
Associate Professor of Forest Resources
B.S., University of Minnesota, 1954; M.S., University of Maine, 1958; PH.D., University of Minnesota, 1964.
Appointed 1965.

Orent, Ammon
Assistant Professor of Anthropology
B.A., Brooklyn College, 1960; M.A., University of Arizona, 1963; PH.D., Boston University, 1968. Appointed 1968.

Orr, Wendell E.
Assistant Professor of Music
B.S., Lawrence College, 1952; B.MUS., *ibid.*, 1955; M.MUS., University of Michigan, 1957. Appointed 1964.

Owens, Charles W.
Assistant Professor of Chemistry
B.S., Colorado College, 1957; PH.D., University of Kansas, 1963. Appointed 1963.

Paella, Natalo A.
Lecturer in Music
M.B., Louisiana State University, 1952; M.M., New England Conservatory of Music, 1958. Appointed 1966.

Palmer, Stuart H.
Professor of Sociology
B.A., Yale College, 1949; M.A., Yale University, 1951; PH.D., *ibid.*, 1955.
Appointed 1955.

Partridge, Allan B.
Associate Professor of History
A.B., Clark University, 1922; A.M., *ibid.*, 1923. Appointed 1925.

Pawling, Mary J.
Instructor in Physical Education for Women
B.S., Pennsylvania State University, 1965.
Appointed 1968.

†Pawuk, William H.
Instructor in Botany
B.S., Pennsylvania State University, 1965; M.S., *ibid.*, 1967. Appointed 1967.

***Peck, Rhoda M.**
Assistant Professor of Home Economics
B.S., New York University College for Teachers, 1955; M.S., University of Maryland, 1968. Appointed 1968.

***†Peirce, Lincoln C.**
Professor of Plant Science
B.S., Cornell University, 1952; PH.D., University of Minnesota, 1958.
Appointed 1964.

Pepper, Michael R.
Instructor in Food Service Management
B.S., University of New Hampshire, 1966.
Appointed 1967.

***Peters, Joan A.**
Editor, Cooperative Extension Service, and Assistant Professor of Home Economics
B.SC., Acadia University, 1953; M.S., Pennsylvania State University, 1955.
Appointed 1960.

†Peterson, Nobel K.
Associate Professor of Soil and Water Science
B.S., Kansas State College, 1948; M.S., Purdue University, 1950; PH.D., Rutgers University, 1957. Appointed 1957.

Petroski, Joseph J.
Associate Professor of Education
B.A., University of New Hampshire, 1947; M.ED., *ibid.*, 1952; D.ED., Harvard University, 1960. Appointed 1964.

Pevear, Richard L.
Instructor in English
B.A., Allegheny College, 1964; MA., University of Virginia, 1965. Appointed 1965.

Pew, Richard H.
Associate Professor of Hotel Administration
B.S., Cornell University, 1933.
Appointed 1963.

Phelps, John E.
Assistant Professor of Chemistry
B.S., East Texas State University, 1964; PH.D., University of Texas, 1969.
Appointed 1969.

Pierce, Robert S.
Adjunct Associate Professor of Forest Resources and Soil and Water Science
B.S., University of Michigan, 1949; M.S., University of Wisconsin, 1952; PH.D., *ibid.*, 1957. Appointed 1967.

Pilar, Frank L.
Professor of Chemistry
B.S., University of Nebraska, 1951; M.S., *ibid.*, 1953; PH.D., University of Cincinatti, 1957. Appointed 1957.

Pine, Gerald J.
Associate Professor of Education
A.B., Boston College, 1955; M.ED., *ibid.*, 1957; ED.D., Boston University, 1963.
Appointed 1966.

Pine, Mary A.
Instructor in Education
B.S., Boston University, 1952; M.ED., *ibid.*, 1955. Appointed 1967.

Poisson, Leandre
Instructor in Home Economics
B.F.A., Rhode Island School of Design, 1958. Appointed 1967.

Pokoski, John L.
Assistant Professor of Electrical Engineering
B.S., St. Louis University, 1959; M.S., Arizona State University, 1965; PH.D., Montana State University, 1967.
Appointed 1967.

Polk, Keith
Assistant Professor of Music
B.A., San Diego State College, 1956; M.M., University of Wisconsin, 1958; PH.D., University of California at Berkeley, 1968.
Appointed 1964.

Poll, Solomon
Professor of Sociology
B.S., Temple University, 1955; M.A., University of Pennsylvania, 1957; PH.D., *ibid.*, 1960. Appointed 1964.

Poole, Alan J.
Research Associate in Chemistry
B.F.C., University of Manchester, (England), 1965; PH.D., *ibid.*, 1969.
Appointed 1969.

Potter, Alfred R.
Associate Professor of The Arts
B.F.A., Massachusetts School of Art, 1955; M.F.A., Cranbrook Academy of Art, 1960.
Appointed 1960.

Potter, Hugh M., III
Assistant Professor of English
A.B., Union College, 1954; M.A., University of North Carolina, 1957; PH.D., University of Minnesota, 1965.
Appointed 1962.

Prince, Allan B.
Assistant Vice-President for Research and Professor of Soil and Water Science
B.S., Rutgers University, 1947; PH.D., *ibid.*, 1950. Appointed 1954.

Pritchard, Hugh C.
Reference Librarian; Professor
B.A., University of Washington, 1939; M.A., University of North Carolina, 1942; M.S., Columbia University, 1950.
Appointed 1954.

Puth, Robert C.
Assistant Professor of Economics
B.A., Carleton College, 1958; M.A., Northwestern University, 1965; PH.D., *ibid.*, 1967. Appointed 1967.

Quimby, C. Paul, Jr.
Instructor in Education
B.S., Bates College, 1942; M.ED., Boston University School of Education, 1947.
Appointed 1968.

Radlow, James
Professor of Applied Mathematics
B.A., City College, New York, 1943; SC.M., Brown University, 1945; PH.D., New York University, 1957. Appointed 1965.

Rainbolt, Wynn M.
Instructor in Communications, Thompson School of Applied Science
B.A., Harvard University, 1960.
Appointed 1966.

Rand, M. Elizabeth
Associate Professor of Home Economics
A.B., Wheaton College, 1930; M.ED., Boston University, 1946. Appointed 1948.

Rasmussen, Mary H.
Lecturer in Music
B.A., University of New Hampshire, 1952; M.M., University of Illinois, 1953; M.L.S., *ibid.*, 1956. Appointed 1968.

Reade, Lewis P.
Adjunct Associate Professor, Whittemore School of Business and Economics
B.S.M.E., University of Miami (Florida), 1953. Appointed 1969.

Reed, Robert C.
Order Librarian; Associate Professor
B.A., Hartwick College, 1953; M.A.L.S., University of Michigan, 1960.
Appointed 1960.

†Reeves, Roger Marcel
Assistant Professor of Entomology and Forest Resources
B.S., S.U.N.Y., College of Forestry, Syracuse University, 1957; M.S., Cornell University, 1961; PH.D., S.U.N.Y., College of Forestry, Syracuse University, 1964.
Appointed 1964.

Reske, Hermann W.
Professor of German
Cand. Phil., University of Frankfurt, 1936; M.A., University of Toronto, 1957; PH.D., *ibid.*, 1960. Appointed 1962.

Reske, Hildegard S.
Instructor in German
Cand. Med., University of Frankfurt, Main, 1935; A.B., Heidelberg College, 1960; M.A., Middlebury, 1963.
Appointed 1963.

†Rich, Avery E.
Professor of Botany
B.S., University of Maine, 1937; M.S., *ibid.*, 1939; PH.D., State College of Washington, 1950.
Appointed 1941 to 1943, 1950.

†Richards, Mathias C.
Associate Dean of the College of Agriculture and Professor of Botany
B.S., Utah State Agricultural College, 1932; PH.D., Cornell University, 1938.
Appointed 1941.

Richardson, John C.
Associate Professor of English
A.B., Dartmouth College, 1941; M.A., Columbia University, 1942; PH.D., Boston University, 1959. Appointed 1946.

***†Riker, Joseph T., III**
Assistant Professor of Animal Sciences
B.S., Oregon State University, 1962; M.S., *ibid.*, 1964; PH.D., Purdue University, 1966.
Appointed 1966.

†Ringrose, Richard C.
Professor of Poultry Science
B.S., Cornell University, 1932; PH.D., *ibid.*, 1936. Appointed 1942.

Robinson, Frederick J.
Director, Merrimack Valley Branch of the University Extension Service and Assistant Professor of Mathematics
B.S., University of New Hampshire, 1949; M.A., *ibid.*, 1955. Appointed 1949.

Rogers, Ada-Louise H.
Assistant Professor of Music
B.A., B.M., Brenau College, 1944; M.S., Julliard School of Music, 1949.
Appointed 1967.

Rogers, John
Assistant Professor of Music
B.A., B.M., University of Georgia, 1960; M.M., Yale University, 1962; M.F.A., Princeton University, 1966.
Appointed 1967.

†Rogers, Owen M.
Associate Professor of Horticulture
B.V.A., University of Massachusetts, 1952; M.S., Cornell University, 1954; PH.D., Pennsylvania State University, 1959.
Appointed 1959.

Romoser, George K.
Associate Professor of Political Science
A.B., Rutgers University, 1951; A.M., University of Chicago, 1954; PH.D., *ibid.*, 1958. Appointed 1961 to 1962, 1967.

Root, James F.
Football Coach and Assistant Professor of Physical Education
B.A., Miami University, Ohio, 1953.
Appointed 1968.

Rosen, Sam
Professor of Economics
A.B., University of Wisconsin, 1942; A.M., Harvard University, 1948; PH.D., *ibid.*, 1952. Appointed 1957.

Ross, Paul
Lecturer in Music
Appointed 1967.

Ross, Shepley L.
Professor of Mathematics
A.B., Boston University, 1949; A.M., *ibid.*, 1950; PH.D., *ibid.*, 1953.
Appointed 1955.

Rothwell, Kenneth J.
Professor of Economics
B.A., University of Western Australia, 1949; M.A., *ibid.*, 1955; PH.D., Harvard University, 1961. Appointed 1963.

Rouman, John C.
Assistant Professor of Classics
B.A., Carleton College, 1950; M.A., Columbia University, 1951; PH.D., University of Wisconsin, 1965. Appointed 1965.

†Routley, Douglas G.
Associate Professor of Biochemistry and Plant Science.
B.S.A., University of British Columbia, 1952; M.S., Pennsylvania State University, 1953; PH.D., *ibid.*, 1957.
Appointed 1957.

Royal, Mary P.
Instructor in Home Economics
B.S., Indiana State University, 1962; M.S., *ibid.*, 1964. Appointed 1968.

Rutstein, Joel S.
Assistant Reference Librarian; Instructor
B.A., University of Vermont, 1962; A.M., Boston University, 1963; M.S.L.S., Simmons College, 1967.
Appointed 1967.

Rutledge, Edward F.
Assistant Professor of Psychology
B.A., University of New Hampshire, 1960; M.A., State University of Iowa; 1962; PH.D., *ibid.*, 1963.
Appointed 1964.

Rutman, Darrett B.
Professor of History
A.B., University of Illinois, 1950; PH.D., University of Virginia, 1959.
Appointed 1968.

Samuels, Fred
Assistant Professor of Sociology
B.S., City College of New York, 1950; M.A., University of Hawaii, 1963; PH.D., University of Massachusetts, 1966.
Appointed 1966.

Sarkady, Antal A.
Instructor in Physics and Project Engineer, Space Science Center.
B.S., University of New Hampshire, 1964; M.S., *ibid.*, 1967. Appointed 1964.

Sasner, John J., Jr.
Assistant Professor of Zoology
B.A., University of New Hampshire, 1957; M.S., *ibid.*, 1959; PH.D., University of California, 1965. Appointed 1965.

Saunders, Nancy
Cataloger; Instructor
B.A., Douglass College, 1965; M.L.S., Rutgers University, 1966.
Appointed 1966.

Savage, Godfrey H.
Professor of Mechanical Engineering
B.S.E., Princeton University, 1950; M.S., Stanford University, 1951; M.B.A., Harvard University, 1954; ENGR., Stanford University, 1963.
Appointed 1965.

Savage, Peter R.
Associate Professor of Political Science
B.A., University of South Africa, 1956; M.A., Yale University, 1960; PH.D., Cornell University, 1967.
Appointed 1968.

Sawyer, Albert K.
Associate Professor of Chemistry
A.B., Colby College, 1940; M.S., University of Maine, 1947.
Appointed 1949.

Sawyer, Philip J.
Associate Professor of Zoology
B.S., University of New Hampshire, 1940; M.S., *ibid.*, 1948; PH.D., University of Michigan, 1956. Appointed 1952.

Sayre, Edward P.
Assistant Professor of Electrical Engineering
B.E.E., Manhattan College, 1961; M.E.E., New York University, 1962.
Appointed 1968.

Schaefer, Paul E.
Associate Professor of Zoology
A.B., Bethany College, 1926; M.S., Ohio State University, 1931; PH.D., *ibid.*, 1936.
Appointed 1941.

Schneer, Cecil J.
Professor of Geology
A.B., Harvard University, 1943; A.M., *ibid.*, 1949; PH.D., Cornell University, 1954.
Appointed 1950, 1954.

Schoenhoff, Doris M.
Instructor in English
B.A., St. Louis University, 1964; M.A., *ibid.*, 1966. Appointed 1967.

†Schreiber, Richard W.
Professor of Botany
B.S., University of New Hampshire, 1951; M.S., *ibid.*, 1952; PH.D., University of Wisconsin, 1955. Appointed 1957.

Schreiner, Ernst J.
Adjunct Professor of Forest Resources
B.S., Syracuse University, 1926; PH.D., Columbia University, 1930.
Appointed 1964.

Schriver, Charles B.
Assistant Professor of Chemical Engineering
B.S., University of Rhode Island, 1957; M.S., Iowa State University, 1960; PH.D., *ibid.*, 1963. Appointed 1965.

Schudel, Paul H.
Assistant Coach of Athletics and Lecturer in Physical Education
B.S., Miami University (of Ohio) 1966.
Appointed 1968.

Schulz, James H.
Assistant Professor of Economics
B.A., Miami University, 1958; PH.D., Yale University, 1966. Appointed 1965.

Schwarz, Marc L.
Assistant Professor of History
A.B., Bates College, 1959; A.M.T., Harvard University, 1960; PH.D., University of California at Los Angeles, 1965.
Appointed 1967.

Seperson, Marvin A.
Instructor in Education
B.S., University of Kansas, 1959; M.S., *ibid.*, 1965. Appointed 1968.

Shattuck, Gerald B., M.D.
Lecturer in Occupational Therapy
B.S., Dartmouth College, 1942; M.D., Yale, 1946. Appointed 1965.

Shaw, Winifred C.
Associate Professor of The Arts
B.S., Iowa State College, 1945; M.F.A., Cranbrook Academy of Art, 1953.
Appointed 1954.

Shepard, Herbert A.
Visiting Professor of Organizational Behavior
B.A., McMaster University, 1941; M.A., University of Toronto, 1947; PH.D., Massachusetts Institute of Technology, 1950.
Appointed 1968.

Sheridan, Philip J.
Instructor in Classics
B.A., Fordham University, 1965; M.A., Princeton University, 1967.
Appointed 1968.

Sherman, Heidemarie C.
Instructor in Economics
B.A., Wayne State University, 1962; M.A., *ibid.*, 1965. Appointed 1967.

Sherman, James L.
Instructor in German
B.A. Wayne State University, 1959; M.A., Middlebury College, 1961; M.A., University of Michigan, 1965. Appointed 1967.

Shigo, Alex L.
Adjunct Associate Professor of Botany
B.S., Waynesburg College, 1956; M.S., West Virginia University, 1958; PH.D., *ibid.*, 1959. Appointed 1966.

Shor, Ronald E.
Associate Professor of Psychology
B.A., Brandeis University, 1953; M.A., Kansas University, 1955; PH.D., Brandeis University, 1960. Appointed 1967.

Shore, Samuel D.
Assistant Professor of Mathematics
B.S., Juniata College, 1959; M.A., Pennsylvania State University, 1961; PH.D., *ibid.*, 1964. Appointed 1965.

Siddall, David V.
Instructor in English
A.B., Dartmouth College, 1953; M.A., Columbia University, 1960.
Appointed 1965.

Silva, J. Donald
Assistant Professor of Communications, Thompson School of Applied Science
B.A., University of New Hampshire, 1957; M.A., *ibid.*, 1965. Appointed 1963.

Silverman, Robert J.
Professor of Mathematics
B.S., University of Chicago, 1947; M.S., *ibid.*, 1948; PH.D., University of Illinois, 1952. Appointed 1962.

Simpson, Robert E.
Assistant Professor of Physics
B.S., University of Rochester, 1955; M.A., Harvard, 1956; PH.D., *ibid.*, 1960.
Appointed 1963.

Sims, Wilburn L.
Instructor in Speech and Drama
A.B., Dartmouth College, 1960; M.S.T., University of New Hampshire, 1969.
Appointed 1967.

Singer, Frank P.
Instructor in Forest Technology, Thompson School of Applied Science
B.S., Pennsylvania State University, 1963; M.S., *ibid.*, 1964. Appointed 1967.

***†Skoglund, Winthrop C.**
Professor of Poultry Science
B.S., University of New Hampshire, 1938; M.S., Pennsylvania State College, 1940; PH.D., Pennsylvania State University, 1958. Appointed 1950.

Skutt, H. Richard
Associate Professor of Electrical Engineering
B.S., Virginia Polytechnic Institute, 1954; M.S., *ibid.*, 1960; PH.D., Worcester Polytechnic Institute, 1966.
Appointed 1966.

†Slanetz, Lawrence W.
Director, Division of Health Studies and Professor of Microbiology
B.S., Connecticut State College, 1929; PH.D., Yale University, 1932.
Appointed 1932.

***Sloan, Roger P.**
State Forestry Leader, Cooperative Extension Service, and Assistant Professor of Forest Resources
B.S., University of New Hampshire, 1942; M.P.A., Harvard University, 1960.
Appointed 1946.

Smith, Elizabeth C.
Lecturer in Animal Sciences
B.S., St. Lawrence University, 1951; M.S., Pennsylvania State University, 1954; PH.D., *ibid.*, 1958. Appointed 1968.

***Smith, Gerald L.**
Associate Professor of Animal Science
B.S., University of New Hampshire, 1948; M.S., Pennsylvania State College, 1951. Appointed 1948.

Smith, Julian H., III
Instructor in English
B.A., Tulane University, 1959; M.A., *ibid.*, 1962. Appointed 1965.

Smith, Mark R.
Assistant Professor of English
B.A., Northwestern University, 1960. Appointed 1966.

Smith, Maurice D.
Associate Professor of Education
A.B., Dartmouth College, 1948; M.M., University of Michigan, 1950; ED.M., Harvard University, 1958; ED.D., *ibid.*, 1961. Appointed 1967.

Smith, Philip M.
Assistant Professor of Education
B.A., Boston University, 1958; M.ED., *ibid.*, 1965. Appointed 1965.

†Smith, Samuel C.
Associate Professor of Biochemistry and Poultry Science
B.S., Pennsylvania State University, 1955; M.S., *ibid.*, 1958; PH.D., *ibid.*, 1962. Appointed 1961.

Soukaris, Pauline
Assistant Professor of Sociology
B.S., University of New Hampshire, 1950; M.S., Boston University School of Social Work, 1959. Appointed 1959.

Spangenberg, James L.
Associate Professor of Home Economics
B.A., University of Florida, 1943; B.D., Southern Baptist Theological Seminary, 1946; M.A., University of Michigan, 1957; PH.D., Pennsylvania State University, 1966. Appointed 1967.

Spies, Richard C.
Instructor in Spanish
B.A., Brooklyn College, 1967, A.M., Harvard University, 1968. Appointed 1968.

Spilios, Paul G.
Audio-Visual Coordinator and Lecturer in Education
B.A., University of New Hampshire, 1951; M.A., *ibid.*, 1961. Appointed 1965.

Splaine, John E., Jr.
Instructor and Administrative Assistant in Education
B.A., University of New Hampshire, 1963; M.A., *ibid.*, 1965. Appointed 1967.

Steele, Donald E.
Professor of Music
B.M., New England Conservatory of Music, 1946; M.A., Colorado College, 1952. Appointed 1946.

Stewart, Glenn W.
Associate Professor of Geology
B.S., University of New Hampshire, 1935; M.S., Syracuse University, 1937; M.A., Harvard University, 1950.
Appointed 1938 to 1939, 1941

†Stewart, James A.
Assistant Professor of Biochemistry
B.A., St. Anselm's College, 1963; PH.D., University of Connecticut, 1967.
Appointed 1968.

Stokes, Samuel E., Jr.
Associate Professor of French
B.A., Haverford College, 1943; M.A., Columbia University, 1948; PH.D., *ibid.*, 1954. Appointed 1963.

Stone, Deborah E.
Assistant Professor of Education
B.ED., Plymouth Teachers College, 1940; ED.M., Boston University, 1951.
Appointed 1962.

Stone, Robert B.
Assistant Reference Librarian; Assistant Professor
MUS.B., Eastman School of Music, 1932; M.L.S., New York State University, 1963.
Appointed 1964.

Storms, Jack R.
Assistant Professor of Food Service Management, Thompson School of Applied Science
B.S., Cornell University, 1960; M.S., *ibid.*, 1966. Appointed 1966.

Stotz, Kerwin C.
Associate Professor of Electrical Engineering
B.E.E. Rensselaer Polytechnic Institute, 1953; M.E.E., *ibid.*, 1958; PH.D., *ibid.*, 1963. Appointed 1964.

Straus, Murray A.
Professor of Sociology
B.A., University of Wisconsin, 1948; M.S., *ibid.*, 1949; PH.D., *ibid.*, 1956. Appointed 1968.

†**Strout, Richard G.**
Associate Professor of Poultry Science
B.S., University of Maine, 1950; M.S., University of New Hampshire, 1954; PH.D., *ibid.*, 1961. Appointed 1954.

Sullivan, James T.
Instructor in English
A.B., Tufts University, 1961; M.A., Brandeis University, 1963. Appointed 1964.

Sullivan, Margaret J.
Assistant Professor of French
B.A., Fresno State College, 1956. Appointed 1967.

Summers, Richard B.
Lecturer in Music
B.M., New England Conservatory, 1952; M.M., *ibid.*, 1956. Appointed 1966.

*Sutherland, Douglas W. S.
Assistant Professor of Entomology
B.S., University of Vermont, 1955; M.S., University of Delaware, 1960; PH.D., Cornell University. 1965. Appointed 1965.

Swan, Emery F.
Professor of Zoology
B.S., Bates College, 1938; PH.D., University of California, 1942. Appointed 1952.

Sweet, Paul C.
Coach of Track and Cross Country and Professor of Physical Education
B.S., University of Illinois, 1923; M.S., University of Southern California, 1941. Appointed 1924.

Sylvester, Robert P.
Associate Professor of Philosophy
A.B., Amherst College, 1949; M.A., Northwestern University, 1955; PH.D., *ibid.*, 1963. Appointed 1963.

Taft, Charles K.
Professor of Mechanical Engineering
B.A., Amherst College, 1951; B.S., Massachusetts Institute of Technology; 1953; PH.D., Case Institute of Technology, 1960. Appointed 1967.

†**Teeri, Arthur E.**
Professor of Biochemistry
B.S., University of New Hampshire, 1937; M.S., *ibid.*, 1940; PH.D., Rutgers University, 1943. Appointed 1938 to 1940, 1943.

Tellor, Robin
Assistant Coach of Athletics and Assistant Professor of Physical Education
B.S., Bemijdi State College, 1963. Appointed 1965.

Tepper, Louis A., Jr.
Assistant Coach of Athletics and Lecturer in Physical Education
B.S., Rutgers University, 1967. Appointed 1968.

Terninko, John
Assistant Professor of Business Administration
B.S.E.E., Newark College of Engineering, 1961; M.S., Massachusetts Institute of Technology, 1962; PH.D., Case-Western Reserve University, 1968. Appointed 1967.

Thomas, George R.
Professor of The Arts
B.ARCH., Carnegie Institute of Technology, 1930. Appointed 1930.

Tillinghast, Edward K.
Assistant Professor of Zoology
B.S., University of Rhode Island, 1955; M.S., *ibid.*, 1959; PH.D., Duke University, 1966. Appointed 1967.

Tischler, Herbert
Professor of Geology
B.S., Wayne State University, 1950; M.A., University of California, 1955; PH.D., University of Michigan, 1961.
Appointed 1965.

Uebel, J. John
Associate Professor of Chemistry
B.A., Carthage College, 1959; PH.D., University of Illinois, 1964. Appointed 1964.

Underwood, Dale S.
Professor of English
B.A., University of Kansas, 1937; M.A., Yale University, 1947; PH.D., *ibid.*, 1952. Appointed 1958.

Upham, Thomas F.
Coach of Skiing and Lecturer in Physical Education
B.S., University of Colorado, 1966. Appointed 1968.

†Urban, Willard E., Jr.
Associate Professor of Biometrics and Statistician, Agricultural Experiment Station
B.S., Virginia Polytechnic Institute, 1958; M.S., Iowa State University, 1960; PH.D., *ibid.*, 1963. Appointed 1963.

Valentine, Russell L.
Associate Professor of Mechanical Engineering
Certificate in Machine Design, Wentworth Institute, 1942; B.S., Michigan State College, 1951; M.S.M.E., Purdue University, 1953. Appointed 1953.

Valenza, Daniel L.
Assistant Professor of The Arts
A.A.S., School for American Craftsmen at Rochester Institute of Technology, 1956; B.F.A., *ibid.*, 1958. Appointed 1959.

Van Ameyden Van Duym, Hidde H.
Instructor in English
B.A., Montana State University, 1957; M.A., *ibid.*, 1961. Appointed 1965.

Van Ameyden Van Duym, Penelope L.
Instructor in English
B.A., Montana State University, 1962. Appointed 1966.

Verrette, Paul E.
Instructor in Music
B.A., University of New Hampshire, 1952. Appointed 1962.

Vincent, Donald E.
Librarian; Professor
B.A., University of Buffalo, 1949; A.M.L.S., University of Michigan, 1952; A.M., *ibid.*, 1957. Appointed 1962.

Voll, John O.
Instructor in History
A.B., Dartmouth College, 1958; M.A., Harvard University, 1960. Appointed 1965.

Vreeland, Robert P.
Associate Professor of Civil Engineering
B.S., Yale University, 1932; M.S., Columbia University, 1933; M.E., Yale University, 1941. Appointed 1966.

Wakstein, Mason P.
Assistant Professor of Speech and Drama
B.A., Boston University, 1958; M.ED., *ibid.*, 1960; ED.D., *ibid.*, 1967. Appointed 1965.

†Wallace, Oliver P., Sr.
Associate Professor of Forest Resources
B.S., University of New Hampshire, 1937; B.S.F., University of Michigan, 1938; M.F., *ibid.*, 1947; PH.D., *ibid.*, 1954.
Appointed 1953.

Wallace, William H.
Professor of Geography
B.S., Beloit College, 1948; M.S., University of Wisconsin, 1950; PH.D., *ibid.*, 1956. Appointed 1957.

Walsh, Anthony A.
Instructor in Psychology
A.A., Worcester Junior College, 1961; B.A., American International College, 1964; M.S. & C.A.S., Springfield College, 1967. Appointed 1968.

Wang, Tung-Ming
Associate Professor of Civil Engineering
B.S.C.E., National Chiao-Tung University, 1945; M.S.C.E., University of Missouri, 1954; PH.D., Northwestern University, 1960. Appointed 1961.

Waring, Peter
Associate Professor of Music
A.B., Harvard College, 1939; M.A., *ibid.*, 1947; SAC. MUSIC DOC., Union Theological Seminary School of Sacred Music, 1954. Appointed 1966.

***Warren, Richard**
Professor of Poultry Science
B.S., Cornell University, 1934; M.S., *ibid.*, 1935. Appointed 1937.

Watson, Deborah
Cataloger; Instructor
B.A., University of New Hampshire, 1963; M.A., *ibid.*, 1967. Appointed 1967.

Watson, Robert I.
Professor of Psychology
A.B., Dana College, 1933; A.M., Columbia College, 1935; PH.D., *ibid.*, 1938. Appointed 1967.

Wear, Robert E.
Associate Professor of Physical Education and Athletics
B.A., Oberlin College, 1941; M.A., University of Michigan, 1951; PH.D., *ibid.*, 1955. Appointed 1964.

Webb, Wayne D.
Assistant Professor of Education
B.A., University of Redlands, 1955; M.A., *ibid.*, 1956; PH.D., Stanford University, 1967. Appointed 1967.

Webber, Laurance E.
Research Professor and Director, Engineering Experiment Station
B.S., University of New Hampshire, 1934; M.E., *ibid.*, 1940; M.S., *ibid.*, 1946. Appointed 1937.

Webber, William R.
Professor of Physics
B.S., Coe College, 1951; M.S., University of Iowa, 1955; PH.D., *ibid.*, 1957. Appointed 1969.

Weber, James H.
Associate Professor of Chemistry
B.S., Marquette University, 1959; PH.D., Ohio State University, 1963. Appointed 1963.

Webster, Robert G.
Professor of English
B.A., University of New Hampshire, 1926; M.A., *ibid.*, 1930. Appointed 1927.

Weeks, Lucy G.
Visiting Lecturer in Education
B.A., Mills College, 1935. Appointed 1968.

***Weeks, Silas B.**
Associate Professor of Resource Economics
B.S., Cornell University, 1937. Appointed 1954.

Weesner, Theodore W.
Instructor in English
B.A., Michigan State University, 1959; M.F.A., University of Iowa, 1965. Appointed 1966.

Weiland, Walter E.
Assistant Professor of Physical Education
B.S., New York State College, 1957; M.S., Pennsylvania State University, 1958; PH.D., *ibid.*, 1964. Appointed 1964.

Weingartner, James J.
Assistant Professor of History
A.B., Muhlenberg College, 1962; M.S., University of Wisconsin, 1963; PH.D., University of Michigan, 1967. Appointed 1967.

***Wells, Otho S.**
Assistant Professor of Plant Science and Area Horticultural Agent
B.S., North Carolina State University, 1961; M.S., Michigan State University, 1963; PH.D., Rutgers University, 1966. Appointed 1966.

Weston, Joan
Instructor in Physical Education
A.A., Colby Junior College, 1963; B.S., Sargent College, Boston University, 1966. Appointed 1967.

Wetzel, William E.
Assistant Professor of Business Administration
B.A., Wesleyan University, 1950; M.B.A., Temple University, 1965. Appointed 1967.

Weyant, Robert G.
Honorary Fellow, Department of Psychology
B.A., Lafayette College, 1955; M.A., Kent State University, 1957; PH.D., University of Iowa, 1960. Appointed 1969.

†Weyrick, Richard R.
Assistant Professor of Forest Resources
B.S., University of Minnesota, 1953; M.F., *ibid.*, 1961; PH.D., *ibid.*, 1968. Appointed 1964.

Wheeler, Charles M., Jr.
Associate Professor of Chemistry
B.S., West Virginia University, 1947; M.S., *ibid.*, 1949; PH.D., *ibid.*, 1951. Appointed 1950.

Wheeler, Douglas L.
Assistant Professor of History
A.B., Dartmouth College, 1959; A.M., Boston University, 1960; PH.D., *ibid.*, 1963. Appointed 1965.

White, Christopher C.
Assistant Professor of Mathematics
A.B., Bowdoin College, 1959; M.A., Miami University, 1963; PH.D., University of Oregon, 1967. Appointed 1967.

Whitlock, John B.
Associate Professor of Music
B.ED., Southern Illinois Normal University, 1937; M.A., State University of Iowa, 1941; PH.D., *ibid.*, 1958. Appointed 1958.

Whitman, Kathryn M.
Instructor in Occupational Therapy
Diploma, Boston School of Occupational Therapy, 1945. Appointed 1968.

Whittier, Duane H.
Associate Professor of Philosophy
B.A., University of New Hampshire, 1950; M.A., University of Illinois, 1952; PH.D., *ibid.*, 1961. Appointed 1967.

Wicks, John D.
Associate Professor of Music
A.B., Harvard University, 1944; A.M., *ibid.*, 1947; PH.D., *ibid.*, 1959. Appointed 1956.

Williams, Howard H.
Assistant Professor of Music
A.B., University of California at Berkeley, 1954; M.A., *ibid.*, 1965. Appointed 1965.

Williams, Thomas A., Jr.
Professor of English
B.A., University of New Hampshire, 1950; M.A., *ibid.*, 1958. Appointed 1958.

Willits, Robin D.
Associate Professor of Business Administration
A.B., Middlebury College, 1947; B.S., Massachusetts Institute of Technology, 1948; PH.D., *ibid.*, 1965. Appointed 1965.

Wilson, John A.
Assistant Professor of Mechanical Engineering
B.S., Tufts University, 1958; M.S., Northeastern University, 1960. Appointed 1960.

Winn, Alden L.
Professor of Electrical Engineering
B.S., University of New Hampshire, 1937; M.S., Massachusetts Institute of Technology, 1948. Appointed 1948.

Witthoft, William G.
Assistant Professor of Mathematics
PH.B., University of Chicago, 1947; S.B., *ibid.*, 1955; M.S., DePaul University, 1957; S.M., University of Chicago, 1958; PH.D., Illinois Institute of Technology, 1963. Appointed 1964.

Wochholz, Harold F.
Assistant Professor of Electrical Engineering
B.S., Michigan State University, 1958; M.S., *ibid.*, 1959. Appointed 1967.

Woodruff, John H.
Associate Professor of Government
B.A., Pomona College, 1949; M.A., Fletcher School of Law and Diplomacy, Tufts University, 1952; PH.D., Boston University, 1961. Appointed 1966.

Wooster, Caroline S.
Associate Professor of Physical Education
CERT., Sargent School for Physical Education, 1926; B.S., University of New Hampshire, 1934. Appointed 1944.

Wright, Claire W.
Academic Counselor, Office of the Dean of Liberal Arts
A.B., Bates College, 1942; M.A., Boston University, 1945. Appointed 1965.

Wright, Paul A.
Professor of Zoology
S.B., Bates College, 1941; A.M., Harvard University, 1942; PH.D., *ibid.*, 1944. Appointed 1958.

Wrightsman, Dwayne E.
Associate Professor of Finance
M.S., Manchester College, 1958; M.B.A., Indiana University, 1959; PH.D., Michigan State University, 1964. Appointed 1964.

Wurzburg, Frederic W.
Associate Professor of Political Science
B.S., Columbia University, 1956; PH.D., *ibid.*, 1961. Appointed 1963.

†Wybourn, Marjory A.
Professor of Home Economics
B.S., University of Washington, 1944; M.A., Teachers College, Columbia University, 1948; ED.D., *ibid.*, 1958. Appointed 1962.

Yang, Jane C.
Cataloger; Instructor
B.ED., Taiwan Normal University; M.S., Southern Illinois University, 1961; M.S.L.S., Pratt Institute, 1963. Appointed 1966.

Yang, Wei Tseng
Assistant Professor in Mechanical Engineering
B.S., National Sun Yat-sen University, 1945; M.S., Michigan College of Mining and Technology, 1958; D.ENG., Yale University, 1963. Appointed 1963.

Yeaton, Carl G.
Colonel, USAF, Professor of Aerospace Studies
B.S., Ohio State University, 1958. Appointed 1968.

Yen, Yin-Chao
Adjunct Associate Professor of Chemical Engineering
B.S., National Taiwan University, 1951; M.S., Kansas State University, 1956; PH.D., Northwestern University, 1960. Appointed 1965.

Yildiz, Asim
Professor of Mechanics
B.S., M.S., Technical University of Istanbul, 1953; D.ENG., Yale University, 1958. Appointed 1967.

Yount, John A.
Associate Professor of English
B.A., Vanderbilt University, 1960; M.F.A., State University of Iowa, 1962. Appointed 1962 to 1964, 1965.

Zimmerman, Oswald T.
Professor of Chemical Engineering
B.S.E., University of Michigan, 1929; M.S.E., *ibid.*, 1931; PH.D., *ibid.*, 1934. Appointed 1938.

Zoller, J. Harold
Professor of Civil Engineering
B.S.C.E., University of Wyoming, 1941; B.S.S.E., University of Illinois, 1945; PH.D., University of Wisconsin, 1953. Appointed 1958.

Professional Staff. Instruction and Research

Adams, John P.
Assistant University Photographer
Franklin Technical Institute, 1957.
Appointed 1959.

***Ballard, Horace C.**
Agricultural Agent, Belknap County
B.S., Cornell University, 1936.
Appointed 1949.

***Barker, Floyd V.**
Extension Coordinator, Natural Resource Development
B.S., University of Maine, 1948.
Appointed 1967.

***Barton, Letty H.**
Extension Home Economist, Merrimack County
B.S., University of New Hampshire, 1966.
Appointed 1967.

†Booska, Emery P.
Assistant to the Dean, College of Agriculture
B.S., University of Vermont, 1956; M.AGR. ED., University of New Hampshire, 1967.
Appointed 1966.

***Breck, Robert W.**
Forester, Hillsborough County
B.S., University of New Hampshire, 1940; M.F., Yale School of Forestry, 1941.
Appointed 1947.

***Brook, Munro S.**
4-H Youth Development Agent, Coos County
B.A., Middlebury College, 1961; M.A., University of Vermont, 1965.
Appointed 1967.

***Buck, Charles W.**
4-H Youth Development Agent, Hillsborough County
B.S., University of Maine, 1951; M.S., University of New Hampshire, 1968.
Appointed 1955.

***Butterfield, Marcius R.**
4-H Youth Development Agent, Cheshire County
B.S., University of Vermont, 1958.
Appointed 1962.

***Carter, Bobby**
Forester, Belknap County
B.S., University of New Hampshire, 1968.
Appointed 1968.

***Castleton, Carl W.**
4-H Youth Development Agent, Strafford County
B.A., University of New Hampshire, 1967.
Appointed 1968.

***Chamberlin, Roxann**
Assistant 4-H Youth Development Agent, Grafton County
B.S., University of Vermont, 1964.
Appointed 1968.

†Cilley, Herbert L.
Greenhouse Superintendent
B.S., University of New Hampshire, 1948; M.S., *ibid.*, 1965. Appointed 1965.

***Clark, Virginia E.**
4-H Youth Development Agent, Merrimack County
B.E., Keene State College, 1942.
Appointed 1963.

Clarke, E. Warren
Coordinator, Civil Defense Training Program
A.B., Franklin College of Indiana, 1950; B.D., Andover-Newton Theological School, 1954. Appointed 1964.

***Clifford, Robert L.**
4-H Youth Development Agent, Belknap County
B.S., University of New Hampshire, 1957.
Appointed 1960.

***Colby, Perley D.**
Agricultural Agent, Hillsborough County
B.S., University of New Hampshire, 1952.
Appointed 1953.

***Colby, Stanley W.**
Agricultural Agent, Sullivan County
B.S., University of New Hampshire, 1934.
Appointed 1940.

*Comerford, Edward V.
Agricultural Agent, Cheshire County
B.S., University of New Hampshire, 1937.
Appointed 1945.

*†Corrow, Henry W., Jr.
Editor, Cooperative Extension Service
B.S., Boston University, 1948.
Appointed 1953.

*Currier, Muriel B.
Extension Home Economist, Grafton County
B.S., Farmington State Teachers College, 1939. Appointed 1951 to 1952, 1953.

*Cutter, Arthur H.
Agricultural Agent, Strafford County
B.S., University of New Hampshire, 1936; M.E., *ibid.*, 1956. Appointed 1955.

*Damon, John F.
Agricultural Agent, Carroll County
B.S., University of New Hampshire, 1961.
Appointed 1961.

*Danko, Thomas
Poultry Area Agent, Belknap, Cheshire, Hillsborough, and Merrimack Counties
B.S., University of Massachusetts, 1952; M.S., University of New Hampshire, 1968.
Appointed 1957.

*Davis, Marion S.
Extension Home Economist, Sullivan County
B.E., Keene Normal School, 1929.
Appointed 1937.

DesRuisseaux, Louis R.
Emergency Operations Instructor, Civil Defense Training Program
B.S., Fordham University, 1946.
Appointed 1966.

*Dodge, Arthur G., Jr.
Forester, Carroll County
A.A., Boston University, 1950; B.S. in FOR., University of Massachusetts, 1953; M.S.F., Harvard University, 1961. Appointed 1960.

*Fabrizio, Richard F.
4-H Youth Development Agent, Grafton County
B.V.A., University of Massachusetts, 1959.
Appointed 1965.

*Fenton, Paul J.
Agricultural Agent, Merrimack County
B.S., University of New Hampshire, 1929; M.S., Cornell University, 1941.
Appointed 1952.

*Ferguson, John R., Jr.
Forester, Cheshire County
B.S., University of New Hampshire, 1960.
Appointed 1965.

Field, Kenneth A., Jr.
Resources Management Instructor, Civil Defense Training Program
B.A., University of New Hampshire, 1950.
Appointed 1965.

*George, Ernest A.
Dairy Area Agent, Hillsborough, Merrimack, and Rockingham Counties
B.S., University of New Hampshire, 1951.
Appointed 1955.

*Hall, James W.
Dairy Area Agent, Belknap, Carroll, Coos, and Strafford Counties
B.S., University of New Hampshire, 1957; M.S., Colorado State University, 1967.
Appointed 1959.

*Head, Ivan E.
4-H Youth Development Agent, Sullivan County
B.S., University of New Hampshire, 1951; M.AG.ED., *ibid.*, 1959. Appointed 1963.

*†Josselyn, Dorothy
Chemist
B.S., University of New Hampshire, 1958; M.S., *ibid.*, 1962. Appointed 1947.

*Kendall, Shirley M.
Extension Home Economist, Cheshire County
B.S., Nasson College, 1945.
Appointed 1968.

***Kennedy, Kevin B.**
Dairy Area Agent, Cheshire, Grafton, and Sullivan Counties
B.S.A., Ontario Agricultural College, 1949. Appointed 1955.

***Knowles, Stanley W.**
Forester, Rockingham County
B.S., University of New Hampshire, 1959. Appointed 1961.

***Knox, Harry B.**
4-H Youth Development Agent, Rockingham County
B.S., University of New Hampshire, 1950. Appointed 1954.

***Leighton, Roger S.**
Forester, Strafford County
B.S., University of New Hampshire, 1941. Appointed 1952.

***Littlefield, Ralph B.**
State Agricultural Agent Leader
B.S., University of New Hampshire, 1927. Appointed 1940.

***Marty, Mamie**
Extension Home Economist, Strafford County
B.S., University of Wisconsin, 1942; M.S., *ibid.*, 1965. Appointed 1964 to 1968, 1968.

McClendon, Roy E.
Assistant to the Director of University Extension Service
B.A., Oberlin College, 1950; M.A.T., University of New Hampshire, 1968. Appointed 1968.

Miller, Carl R.
Radiological Defense Instructor, Civil Defense Training Program
B.S., University of Maine, 1962; M.S., Massachusetts Institute of Technology, 1964. Appointed 1965.

***Miller, Milan M.**
Assistant Forester, Grafton County
B.S., Iowa State University, 1964. Appointed 1968.

†Morse, Wallace J.
Entomologist
B.S., University of New Hampshire, 1943. Appointed 1943.

Murphy, Carmita A.
Assistant Director of University Extension Service and Summer Session
B.A., University of New Hampshire, 1957; M.A., *ibid.*, 1965. Appointed 1967.

***Nissen, Harriet J.**
Extension Home Economist, Hillsborough County
B.S., Nasson College, 1941; M.ED., Cornell University, 1953. Appointed 1956.

Olivier, Maurice E.
Operations Manager, Bureau of Educational Research and Testing Services
B.S., University of New Hampshire, 1968. Appointed 1968.

***Ouellette, Gerald J.**
County Forester-at-Large, Forest Recreation Business Specialist
B.S., University of New Hampshire, 1961; M.S., University of Massachusetts, 1967. Appointed 1966.

Pike, Radcliffe B.
Horticulturist
A.B., Bowdoin College, 1950; M.S., University of New Hampshire, 1952. Appointed 1963.

Prough, Elizabeth A.
4-H Youth Development Agent, Hillsborough County
B.S., Pennsylvania State University, 1958. Appointed 1960.

Puffer, Winthrop F.
Assistant to the Dean, Whittemore School of Business and Economics
B.D., Tufts University, 1956; S.T.B., Boston University School of Theology, 1959. Appointed 1967.

Putz, George J.
Liaison Officer, Bureau of Educational Research and Testing Services
B.A., Lawrence University, 1964. Appointed 1968.

*Rich, Wayne S.
4-H Youth Development Agent, Merrimack County
B.S., University of Maine, 1934.
Appointed 1946.

*Roper, Elizabeth R.
4-H Youth Development Agent, Carroll County
B.A., University of New Hampshire, 1928.
Appointed 1928.

*Rutherford, Richard R.
Agricultural Agent, Grafton County
B.S., University of New Hampshire, 1940.
Appointed 1940 to 1942, 1948.

*Sargent, John E.
Forester, Coos County
B.S., University of New Hampshire, 1959.
Appointed 1960.

*Sargent, Leslie B., Jr.
Forester, Grafton County
B.S., University of New Hampshire, 1943.
Appointed 1954.

Serotkin, Jeffrey C.
Assistant to the Dean of the College of Technology
B.S., Delaware Valley College, 1964; M.S., University of New Hampshire, 1968.
Appointed 1968.

Shulda, Joseph F.
Assistant to the Director of the University Extension Service and Summer Session
A.B., St. Anselm's College, 1962; M.ED., University of New Hampshire, 1967.
Appointed 1967.

Soper, Margaret B.
Assistant to the Director of University Extension Service
B.A., University of New Hampshire, 1939.
Appointed 1966.

Steiner, Robert J.
Assistant to the Director for the Merrimack Valley Branch
B.S., University of Connecticut, 1952; M.ED., University of Rhode Island, 1966.
Appointed 1966.

*Stevens, Robert A.
Program Specialist, 4-H Youth Development
B.S., University of New Hampshire, 1937.
Appointed 1955.

*Stewart, Edwina P.
Extension Home Economist, Grafton County
B.S., Farmington State Teachers College, 1943. Appointed 1965.

*Stimson, Ruth G.
Extension Home Economist, Rockingham County
B.S., University of New Hampshire, 1940; M.ED., *ibid.*, 1944. Appointed 1942.

*Stocking, Marion I.
Extension Home Economist, Carroll County
B.S., Simmons College, 1949.
Appointed 1958.

*Szymujko, Joseph A.
Forester, Sullivan County
B.S., University of New Hampshire, 1954.
Appointed 1957.

*Thompson, Wilbur E.
Forester, Merrimack County
B.S., University of New Hampshire, 1927.
Appointed 1945.

*Upham, Edward F.
Agricultural Agent, Rockingham County
B.S., University of Massachusetts, 1953; M.S., *ibid.*, 1954. Appointed 1960.

†Whittaker, Donald A.
Poultry Farm Superintendent
B.S., University of New Hampshire, 1961.
Appointed 1967.

Wilson, Irja H.
Consultant Nurse Trainer
New England Deaconess Hospital School of Nursing, 1943; B.S., Boston University, 1954; M.N., University of Minnesota, 1958. Appointed 1968.

*Wyman, Christine C.
4-H Youth Development Agent, Strafford County
B.S., University of New Hampshire, 1944.
Appointed 1963.

Administrative Divisions

Admissions
Eugene A. Savage, *Director*

Agriculture, College of
Harry A. Keener, *Dean and Director of the Agricultural Experiment Station*
Mathias C. Richards, *Associate Dean*
Samuel W. Hoitt, *Director, Cooperative Extension Service*
Philip S. Barton, *Director, Thompson School of Applied Science*
Emery P. Booska, *Assistant to the Dean*

Alumni Affairs
Burnell V. Bryant, *Director*
George W. Bamford, *Fund Director*
L. Franklin Heald, *Editor*
Mary Semitros, *Recorder*
Edward A. Snell, *Activities Director*
Richard C. Plumer, *Director, Alumni Information, Concord, N. H.*

Audio-Visual Center
John D. Bardwell, *Director*
Paul G. Spilios, *Assistant Director*

Bookstore
Robert B. Stevenson, *Manager*

Business Office
Herbert E. Kimball

Center for Educational Field Services
Jason E. Boynton, *Director*

Chaplains
Rev. Charles N. Gross, *Protestant Chaplain*, United Protestant Association
Rev. Vincent Lawless, *Catholic Chaplain*, Pastor, St. Thomas Moré
Rev. Albert W. Snow, *Episcopal Chaplain*, Rector, St. George's

Civil Defense Training
E. Warren Clarke, *Coordinator*

Computation Center
W. Richard Burrows, *Manager*, Computational Services

Cooperative Extension Service
Samuel W. Hoitt, *Director*

Coordinator of Research
William H. Drew, *Coordinator*

Counseling and Testing Center
Robert G. Congdon, *Director*
Kathleen R. Beckingham, *Supervisor of Testing*

Cultural Events
Raymond E. Matheson, *Director*

Dining Services
Jane E. Griswold, *Director*

Engineering Design and Analysis Laboratory
Godfrey H. Savage, *Director*
Fletcher A. Blanchard, *Associate Director*

Engineering Experiment Station
Laurance E. Webber, *Director*

Educational Research and Testing Services
Gilbert R. Austin, *Director*

Financial Aids
Jane B. Stearns, *Financial Aids Officer*

Graduate School
Trevor Colbourn, *Dean*
William H. Drew, *Associate Dean*

Health Service
Charles H. Howarth, M.D., *Director*
William D. Crandall, M.D., *Assistant Director*
Richard Cilley, M.D.
Harriet C. Nason, R.N., *Supervisor of Nursing*

Health Studies, Division of
Lawrence W. Slanetz, *Director*

Industrial and Community Services
Gordon O. Thayer, *Director*

Intercollegiate Athletics
Andrew T. Mooradian, *Director*

International Student Adviser
Raymond E. Matheson, *Director*

Institutional Research and Planning
John B. Hraba, *Dean*

Jackson Estuarine Laboratory
Galen E. Jones, *Director*

Liberal Arts, College of
Eugene S. Mills, *Dean*
Melville Nielson, *Associate Dean*
Warren H. Held, *Associate Dean*
Claire W. Wright, *Academic Counselor*
L. Jackson Newell, *Assistant to the Dean*

Library
Donald E. Vincent, *Librarian*

Marine Science and Technology
E. Eugene Allmendinger,
Executive Officer

Memorial Union
Wayne W. Justham, *Director*

Museum
Philip A. Wilcox, *Curator*

New England Center for Continuing Education
Harry P. Day, *Director*

Personnel, Non-Academic
Omer R. Morin, *Director*

Photo Service
Richard D. Merritt,
University Photographer

Physical Plant Development
Richard M. Brayton, *Director*

Placement Service
Edward J. Doherty, *Director*

President's Office
John W. McConnell, *President*
Jere A. Chase, *Executive Vice President*
Norman W. Myers,
Vice President-Treasurer
Robert F. Barlow,
Academic Vice President
Robert N. Faiman,
Vice President for Research
Arthur S. Adams,
Consultant to the President
W. Arthur Grant,
Assistant to the President
Allan B. Prince, *Assistant Vice President for Research*
David W. Ellis, *Associate, Office of the Academic Vice President*
Leslie L. LaFond, *Staff Associate, Office of the Executive Vice President*

Printing Service
Reginald W. King, *Manager*

Properties (Buildings and Grounds)
Eugene H. Leaver, *Superintendent*
Clifton P. Hildreth, *Security Officer*
John F. Donovan, *Fire Chief*

Public Administration Service
Lawrence W. O'Connell, *Director*

Public Television
Keith J. Nighbert, *Manager,*
New Hampshire Network (WENH-TV)

Purchasing
Russell C. Smith, *Purchasing Agent*

Radiation Safety Office
Carl Miller, *Radiation Safety Officer*

Registration and Records
Leslie C. Turner, *Registrar*

Reserve Officers Training Corps
Col. Pierre D. Boy, *Professor of Military Science*
Col. Carl G. Yeaton, *Professor of Aerospace Studies*

Resources Development Center
William F. Henry, *Chairman*
Owen B. Durgin, *Associate Chairman*

Space Science Center
William R. Webber, *Director*
Dale L. Chinburg, *Associate Director*

Students, Dean of
C. Robert Keesey, *Dean*
Elizabeth A. McQuade, *Associate Dean*
Ruth A. Hurley, *Assistant Dean*

Summer Session
Edward J. Durnall, *Director*

Technology, College of
Richard S. Davis, *Dean*
Tenho S. Kauppinen, *Assistant Dean*

Thompson School of Applied Science
Philip S. Barton, *Director*

University Development
J. R. Sandberg, *Director*

University Extension Service
Edward J. Durnall, *Director*

University Relations
William M. Stearns, *Director*
L. Franklin Heald, *Director of University Publications*
Thomas H. Slayton, *University News Bureau*

University Residences
Stanley E. Plummer

Water Resources Research Center
Gordon L. Byers, *Chairman*

Whittemore School of Business and Economics
Jan E. Clee, *Dean*
Richard L. Mills, *Assistant Dean*

General Information

Facts About the University

History

Founded in 1886, the University of New Hampshire began as the New Hampshire College of Agriculture and the Mechanic Arts, located in Hanover as part of Dartmouth College. In 1893 it moved to its present site in Durham. The new campus was made possible by Benjamin Thompson, a prosperous farmer who bequeathed his land and money to the state for this purpose. The estate was valued at $800,000 when it was made available to the College in 1910.

The College prospered in Durham and in 1923 the State Legislature granted it a new charter as the University of New Hampshire, composed of the Colleges of Agriculture, Liberal Arts, and Technology. The Graduate School was formally added in 1928, and the Whittemore School of Business and Economics in 1962. A year later, the state's system of higher education was formally established when the two former teachers' colleges were made divisions of the University and brought under the same Board of Trustees as the Durham campus.

In the 1968-69 academic year, the University at Durham had 7,229 students enrolled. The State Colleges at Plymouth and Keene had a combined enrollment of 3,300 students, and more than 1,000 students were enrolled in evening programs at the University's Merrimack Valley Branch in Manchester.

Physical Plant

The University campus in Durham covers 156 acres. There are 35 buildings devoted to instruction, research, and administration; 24 residence halls housing about 4,000 men and women; and three modern dining halls. Total University lands — including athletic fields and woodlots — comprise 2,830 acres. Book value of the physical plant exceeds $42,000,000. Major construction projects in recent years include:

Social Science Center, housing the Graduate School offices and the Departments of Political Science, Sociology, and History.

University Library, with 481,000 volumes, 2,800 periodicals, and a substantial microfilm collection, is now being expanded to accommodate up to one million volumes and to provide increased study area.

Whittemore School of Business and Economics will occupy a new three-story building containing classrooms, seminar rooms, lecture halls, offices, and sophisticated business and technological equipment.

Parsons Hall, the first phase of which was completed in 1966, is undergoing further expansion to provide completely modern facilities for the Department of Chemistry.

Memorial Union, the campus student union, is in the process of major expansion to accommodate the University's steadily growing student body.

Physical Education Facility, with indoor track, gymnasia, and pool, and

Snively Arena, an indoor ice hockey rink.

Other new buildings since 1958 include *Paul Arts Center*, containing two theaters and separate wings for music, drama and the arts; the new laboratory classroom building serving the *Thompson School of Applied Science; Spaulding Life Sciences Building*, with facilities for Biochemistry, Microbiology, and Zoology; and expanded housing facilities for undergraduate, graduate, and married students.

Service and Research

The *Division of Industrial and Community Services* coordinates the University's many service activities. One of the largest of the units engaged in such work is the *Agricultural Experiment Station*, which conducts research, publishes the results, and provides testing services for New Hampshire farmers. The *Engineering Experiment Station* performs similar services for New Hampshire industry.

The *Cooperative Extension Service*, operating in conjunction with the U.S. Department of Agriculture and coordinating councils in each of the state's ten counties, bridges the gap between campus research and the people of the state. Formal adult education is provided by the *University Extension Service*, which offers credit and non-credit courses throughout the state.

The University operates New Hampshire's educational television station, *WENH-TV*, broadcasting in-school programs for elementary and secondary schools, as well as cultural and educational programs in the evening hours which can be viewed by 98 percent of the state's people.

The *New England Center*, a cooperative endeavor by the six state universities of New England to provide outstanding continuing education programs for the region, is located on the campus. Its administration center provides offices for several regionally oriented educational organizations. Construction of NEC's first residence · dining · learning center facility is to be completed during this academic year.

Other University units serving the state and its people include the *Resources Development Center*, which brings the talents and techniques of the social scientist into closer partnership with federal, state, and local governments; the *Public Administration Service*, assisting state, county, and local government in the area of municipal services; the *Water Resources Research Center*, coordinating research projects aimed at conserving and developing the state's water supply; and the *Bureau of Educational Research and Testing Services*, which designs, scores, and evaluates student testing programs at the elementary, secondary, and college level. The New Hampshire *State Entomologist* and *State Geologist* are University faculty members with offices on the campus.

Research in *Oceanography* is carried on in the biological, physical, and engineering sciences, and a number of departments offer courses, some associated with other colleges and universities, which are oriented toward marine science and ocean engineering.

Other specialized research facilities include the *Space Science Center* in De-Meritt Hall; the *Engineering Design and Analysis Laboratory* and the *Computation Center*, both located in Kingsbury Hall; the *Ritzman Nutrition Laboratory*; and the new *Jackson Estuarine Laboratory* on the Great Bay estuary.

Cultural Activities

With two theaters, two art galleries, and auditoriums seating up to 5,000 persons, the University is a major cultural resource for the entire state. The *Spaulding Distinguished Lecture Series* and the *Sidore Lecture Series* bring provocative, well-known leaders and scholars to the campus throughout the year. The *Blue and White Series* is host to leading concert artists, and the *Allied Art Series* provides a varied program of drama,

music and dance. A student film society sponsors a classic film series and University students perform frequently in concerts and recitals.

The University Library has music listening rooms for students and a collection of more than 3,000 records. There is also a student FM radio station.

Admissions Procedure

University admissions policy is designed to provide for the admission of those students whose personal record, achievement, aptitude, and motivation demonstrate that they have the qualifications for carrying the desired program satisfactorily.

The University admits in-state residents who have a scholastic record which ranks them in the upper two-fifths of their graduating classes from accredited or approved secondary schools, provided they are recommended or certified, and have an appropriate college preparatory background.

All candidates for admission to the University are required to submit the results of the College Entrance Examination Board Scholastic Aptitude Test taken during their senior year, except in those cases where the junior Scholastic Aptitude Test is deemed satisfactory. The English Composition Achievement Test taken during the senior year must also be submitted by all candidates and, for those applying to the College of Liberal Arts and the Whittemore School of Business and Economics, an Achievement Test in a foreign language is required. The achievement test results are used in course placement rather than in the admissions process, so it is possible for students to submit these results as late as May of their senior year. Other achievement tests are strongly recommended for applicants in the College of Agriculture and the College of Technology in an area or areas generally related to the student's prospective major, e.g., Level I Mathematics Test for engineering students.

Interviews are not required as part of the admission process. They may, however, be requested by the Admissions Office if deemed necessary or desirable to make an equitable decision. Group information sessions by appointment are frequently held on Saturday mornings. These group sessions are essentially opportunities for information exchange and are followed by guided tours of the campus. Applicants are encouraged to visit the campus in any event, and regularly scheduled tours leave the Memorial Union at 2:00 p.m. Saturday and Sunday when college is in session.

The number of out-of-state students admitted each year is limited and selection is made primarily on the basis of superior academic achievement in secondary school. Such traits as good character, leadership, initiative, and creative ability are considered.

All applicants living in New Hampshire are required to submit a notarized statement to the effect that their parents are legally domiciled in the state. Students admitted from states other than New Hampshire or from foreign countries are considered as non-resident throughout their entire attendance at the University unless their parents have gained bonafide residence in New Hampshire. A student, though he may be 21, will not be recognized as a resident by the University unless he can clearly establish that his residence in New Hampshire is for some purpose other than the temporary one of obtaining an education at the University.

Except for early decision candidates, applications should be submitted only after the first term grades are available and for non-resident applicants before February 15.

No New Hampshire applicant can be considered whose application is not complete at least by May 1. Thereafter, he may be considered only as vacancies

occur. A non-refundable application fee — $10.00 for residents of New Hampshire and $15.00 for non-residents — must accompany the application.

The University recommends the secondary academic program outlined in the table titled "Recommended Secondary Program."

The University will consider applicants who have taken less than the recommended programs with the minimums outlined in the table titled "'Minimum Secondary Program."

Applicants might well include courses or other experiences in music, art, and drama in their secondary school programs in addition to more formal academic preparation.

The University participates in the New England Regional Student Program of the New England Board of Higher Education in which each state university in New England offers a number or regional curricula at the undergraduate level to students from the other New England states. Under this program a student receives preferential admissions consideration and if admitted pays in-state tuition. Information may be obtained from the New England Board of Higher Education, 20 Walnut Street, Wellesley, Massachusetts 02181 or from any one of the admissions offices of the six New England state universities.

Early Decision

The University is willing to give applicants an indication of admission, based on scholastic attainment for three years, under an early decision procedure. This plan is specifically appropriate for a well-qualified student who has made the University his first choice and who submits a regular application including junior SAT's with a statement countersigned by the secondary school that UNH is his first choice college and that other applications will be withdrawn if he is admitted under early decision.

Early Admission

Secondary school students who show unusual promise may be admitted early to the University. While it does not actively recruit candidates for college entry before graduation from secondary school, the University will, upon recommendation of the school, review the credentials of those whose academic programs have been unusually successful and extensive. Social and emotional maturity are also considered in selecting candidates for early admission.

Recommended Secondary Program

	Agriculture	*Liberal Arts*	*Technology*	*Whittemore*
English	4 units	4 units	4 units	4 units
Language	2 units	3 units*	3 units	3 units
Mathematics	3 units	3 units	4 units†	3 units
Laboratory Science‡	3 units	3 units||	3 units§	3 units
Social Studies	3 units	3 units	2 units	3 units

Minimum Secondary Program

	Agriculture	*Liberal Arts*	*Technology*	*Whittemore*
English	4 units	4 units	4 units	4 units
Language	0 units	2 units*	0 units	2 units*
Mathematics	2 units	2 units	3 units†	2 units
Laboratory Science‡	1 unit	1 unit||	2 units§	1 unit
Social Studies	2 units	2 units	2 units	2 units

* Of a single foreign language.

† Including algebra I and II, plane geometry, and trigonometry.

‡ Excluding "General Science."

§ Must include Physics and Chemistry,

|| Students majoring in the Division of Health Studies should include biology.

Advanced Standing

The University will recognize unusual secondary school work by means of advanced placement and credit for those who have taken especially enriched or accelerated courses before entering college. Applicants qualify for such credit by satisfactory achievement on University-approved placement examinations including the College Board Advanced Placement Tests. Further information may be obtained from the Admissions Office.

Transfer Students

Qualified candidates for advanced standing from approved institutions may be admitted. Their status is tentatively determined by the quantity and quality of the work completed at the institution from which they come. In transfer, credits are allowable for courses which are appropriate to the curriculum for which the student is admitted and for courses in which grades above the lowest passing grade were received.

While the University is pleased to encourage the competent transfer applicant who has valid and legitimate reasons for desiring the transfer to New Hampshire, it cannot encourage the applicant with a history of academic or personal difficulty. University admissions policy restricts consideration for transfer to those students with satisfactory academic, as well as personal, records. In the event of personal or academic difficulty, a student is usually better advised to return to his former college after an appropriate period and clear his record before attempting to transfer.

Students desiring to transfer for the fall semester must complete application procedures before May 1. Since their records call for careful and thorough evaluation, transfer students may experience more delays than other students, with the result that mid-year transfer is often difficult or impossible. Prospective mid-year transfer students are generally better advised to enter at the beginning of the next academic year. In any event, mid-year applications must be filed prior to December 1.

Fees and Expenses

The cost for the freshman year at the University averages about $2,100 for a resident of New Hampshire and $3,100 for a non-resident.

Tuition is $630 ($1,575 for non-residents). As part of the regional cooperation program of the New England Board of Higher Education, some non-residents from certain states will be eligible at the resident rate in selected curricula. The student must apply to the Registrar for this reduced tuition. Any student registering for eight credits or more per semester pays the full tuition. Any student registering for fewer than eight credits pays $25.00 per credit hour, plus a registration fee of $15 for residents and $50 for non-residents per semester. The minimum fee for any recorded course is $25.00.

All students who are admitted to the University must make an advance deposit of $50 for residents and $100 for non-residents. This deposit will be credited on the student's tuition bill. In case a student decides not to attend the University after making his deposit, it will automatically be forfeited.

Tuition for each semester is payable in advance. Three-fourths will be refunded to a student withdrawing during the first four days of a semester; one-half after four days and within thirty; and none thereafter.

Refundable deposits may be required to cover locker keys or loss or breakage in certain departments. A charge will be made for individual lessons in music, as noted in the description of Applied Music courses. A charge will be made for riding lessons, as noted in the sections on Physical Education for Women and Animal Science.

Books and classroom supplies cost approximately $135. These may be purchased at the University Bookstore.

There is a Memorial Union assessment of $25, a recreational physical education fee of $30, and a student activity tax of $17.80, which includes a subscription to the undergraduate newspaper and yearbook, and membership in Student Union, Student Government, and class activities. An athletic admissions fee of $10 is optional.

Personal expenses average $350. These will vary with the needs of the individual student, and include clothing, laundry, recreation, incidentals, and travel.

The University reserves the right to adjust charges for such items as tuition, board, and room rent from time to time. Such changes will be announced as far in advance as feasible.

A deferred payment plan allows a student to pay one-third of his college bill before registration and one-third at the end of each of the following two months. A $5 fee is charged for this service, and arrangements are made through the Business Office.

Dining Services

University policy requires that freshmen, sophomores, and juniors, except for sorority and fraternity members who eat in their houses, board in University dining halls. Beginning September, 1969, Dining Services can offer students two types of meal plans: A 15-meal-per-week ticket good for meals from breakfast Monday through Friday dinner (evening) at $440 a year or a 21-meal ticket at $500 a year.

These plans provide students with the least expensive means of eating three well-balanced meals per day.

Students who have special diets will generally find it possible to select these diets from the choices offered in the dining halls. However, students whose diets, because of religion or health, require unusual foods should be aware that Dining Services may not be able to meet their needs. Any exception to the board policy because of strict dietary restriction should be made prior to the begining of a semester.

Rebates cannot be made for meals missed because of week-end work, and will only be made to students who withdraw or students who have been away from campus for prolonged periods due to illness. Such illness must be substantiated by a letter from the student's doctor.

Seniors, graduate students, and those not in residence may purchase semester meal tickets if dining hall capacities permit, or they may obtain meals on an a la carte plan from the Memorial Union cafeteria.

University Residences

The University has 22 undergraduate residence halls, of which 13 are for women and 9 are for men. Undergraduate women under 21 years of age are required to live in a residence hall or sorority house unless they live at home or work for a room in a home approved by the Dean of Students. Undergraduate men are not required to live in residence halls, but will be accommodated to the extent of the space available. Room rents range from $276 to $460.

Assignments to University residence halls are normally completed in July and the notice of room assignment forwarded to the student immediately. Most rooms are designed for double occupancy; however, a limited number of single rooms is available. Frequently it is necessary to assign three students to some double rooms in a few residence halls.

All residence hall rooms are furnished with beds, mattresses, desks, chairs,

wastebaskets, and a chest of drawers. In addition, many have desk lamps, mirrors, and draperies. Students care for their own rooms and are responsible for any damage. The residence space assigned is available for occupancy beginning at 8:00 A.M. on the Sunday prior to registration. Students assigned to residence hall rooms are required to sign a room contract for the entire academic year beginning in September and ending in June. Room rental charges do not include the several regular school vacation periods when the halls are closed. Rooms paid for and not occupied one day after registration day may be declared vacant and three-fourths of the room rent returned, unless the individual having the reservation makes written request to the Director of University Residences to hold the room until a later date.

Applications for a room in the residence halls will be sent to the student at the time of official admittance to the University. In the case of upperclassmen, applications will be available prior to room draw in the spring for residence the next academic year.

Financial Aid

The University Financial Aids Office assists promising students who are unable to meet their educational expenses entirely from their own family resources. Aid is available in the form of grants and scholarships, loans, and part-time employment.

In many communities, scholarships and loans are available locally. School principals and guidance counselors have information about these sources of assistance.

Before an applicant may be considered for assistance through the University, two forms must be submitted: the UNH Application for Financial Aid and the Parents' Confidential Statement. New Hampshire applicants may obtain these forms from their high-school. Non-residents and transfer students may obtain the UNH application form from the Financial Aids Office and the Parents' Confidential Statement from their local high schools.

Students must meet the following deadlines and should not wait until being admitted to the University before applying for financial aid:

For grants and scholarships — freshmen, by January 15; upperclassmen, including transfer students, by February 15.

For loans — freshmen by July 1; upperclassmen, including transfer students by February 15.

Grants and Scholarships

A full-time student who is a resident of New Hampshire may be considered for an in-state tuition grant. The amount varies from $100 to full tuition, and the basic consideration is financial need. Non-residents are eligible for similar grants. Scholastic attainment, financial need, and participation in extra-curricular activities are the principal considerations.

The University also participates in the Federally-sponsored Educational Opportunity Grant Program designed to assist students of exceptional need.

There are scholarships for both resident and non-resident students. The basis of these awards may be scholastic attainment, participation in extra-curricular activities, or meeting other requirements specified by the donor.

These are the major scholarship programs for freshmen: Granite State Merit Scholarships, awarded to 20 New Hampshire residents who are outstanding graduates of high schools in the state; Achievement Scholarships, one to a resident and one to a non-resident, with awards based on high achievement plus high aptitude or special talent recognized by appropriate state or regional groups; Valentine Smith Scholarship, awarded to the incoming freshman judged to have the most thorough preparation

for admission to the University, based on the results of the College Entrance Examination Board tests.

The University also sponsors two National Merit Finalists, a resident and a non-resident, who have indicated UNH as the college of their choice.

Students from out of state should have reasonable financial backing since only limited grants and scholarships are available for non-residents.

Loan Programs

Three loan funds are administered by the University: UNH Loan Fund, National Defense, and Nursing Student Loans. Financial need must be clearly demonstrated, and loans may be used only for educational expenses.

Part-Time Employment

The University does not encourage freshmen and transfer students to work during their first semester, but they may do so if they feel they can carry the extra load. The University participates in the College Work-Study Program under Title IC of the Economic Opportunity Act. The purpose of this program is to assist students from low income families and other students who are determined by the University to be in need of financial assistance to complete their college educations.

University Academic Requirements

In addition to the particular requirements for specific degrees established by the colleges, the University requires that every candidate for a bachelor's degree must successfully meet the following general education requirements:

1. Four courses (each of which must carry at least three credits) from the following (biological sciences, physical sciences, and mathematics):

Biological Sciences
Biochemistry
Biology
Botany
Entomology
Microbiology
Zoology

Physical Sciences and Mathematics
Chemistry
Geology
Mathematics
Physical Science
Physics

2. Six courses (each of which must carry at least three credits) from the following (arts, humanities, and social sciences):

Arts and Humanities
Arts
English
Foreign Languages (except elementary year) and Literature
Humanities
Liberal Arts
Music
Philosophy
Speech & Drama

Social Sciences
Anthropology
Economics
Geography (except physical geography)
History
Political Science
Psychology
Sociology
Social Science

3. Six courses, one of which must be freshman English unless specifically exempted by the English Department, (and each of which must carry at least three credits), from all courses offered by the University including those listed above.

The University, College, or Department may prescribe up to eight of the sixteen courses used to satisfy the general education requirements. A minimum of eight courses are to be freely elected by the student. Courses taken to satisfy general education requirements may not be in the student's major department.

A University freshman English course in reading and composition is required of all undergraduates unless specifically exempted by the English Department on the basis of a written English proficiency examination. The freshman English course may not be used to satisfy the arts and humanities requirement in general education.

A physical education proficiency is required of all undergraduates. Students who do not pass the proficiency standards determined by the Departments of Physical Education will take an appropriate program without credit until such time as they pass proficiency tests or for a period not to exceed two years.

College of Agriculture

Harry A. Keener, *Dean*
M. C. Richards, *Associate Dean*

Departments

Animal Sciences
Biochemistry
Botany
Entomology
Forest Resources
Home Economics
Plant Science
Resource Economics
Soil and Water Science

Degrees, Majors and Specializations

BACHELOR OF SCIENCE:

Agricultural Education
Animal Sciences
  Animal Science
  Dairy Science
  Poultry Science
  Pre-Veterinary Medicine
Biochemistry
Botany
Entomology
General Studies
Home Economics
  Family Studies
  Human Nutrition and Dietetics
Plant Science
Resource Economics
Soil and Water Science
  Agricultural Engineering*
  Hydrology
  Soil Science
Wildlife Management

BACHELOR OF SCIENCE IN FORESTRY:

Forestry

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* First two years at the University of New Hampshire; second two years at the University of Maine.

General Information

Purpose and Programs

The objectives of the College of Agriculture are to give the student a fundamental education in the biological, physical, and social sciences and to introduce him to the arts and humanities. In addition specific technical courses are provided in the student's interests and in his major.

The College offers two undergraduate degrees: the Bachelor of Science and the Bachelor of Science in Forestry.

Advisory System

A member of the faculty closely related to the student's area of interest is appointed as an adviser to assist the student in planning his academic program.

The student may select his major upon entering the College or he may wait until registration for the sophomore year.

More than One Undergraduate Degree

A student may obtain more than one undergraduate degree at the University by completing all the curriculum, departmental, scholastic, and other requirements for each degree. Students desiring to earn more than one undergraduate degree should make their plans known to their adviser and the College Deans concerned early in their college careers.

Honors Program

The College of Agriculture, through its various departments, offers the superior student the opportunity to participate in an honors program which is individually designed to provide added intellectual incentives and opportunities. Participation in the honors program is by invitation of a faculty member with the approval of the department concerned and the Dean of the College. It is limited to those students entering the sophomore or junior year with at least a 3.0 grade point average. The recommending faculty member, his department Chairman, and the Dean will constitute the student's academic advisory committee. This committee and the student will decide upon a suitable academic program. Departmental and College course requirements may be waived for students in the program. The student will complete the same number of credits to graduate as other students in the department.

Minor Option

A minor may be earned in any undergraduate discipline in the University in which permission to do so can be arranged by the student in consultation with his major adviser. A minor consists of 18 semester credits with C or better in courses which the adviser in the minor discipline approves. No more than 6 credits used by the student to satisfy curriculum requirements in his major may be used for his minor. He should declare his intent to earn a minor as early as possible and no later than the end of his junior year.

In the student's final semester the adviser for the minor shall certify to the Registrar that the student has completed the minor requirements. Upon graduation the name of the minor shall appear on the student's transcript.

Bachelor of Science

Many professional careers are open for graduates of the college. There are opportunities for people trained in resource development and conservation in addition to positions for serving in agricultural industries. Newly created countries throughout the world are asking for assistance in all phases of agriculture, including home economics and forestry. In all departments students may prepare for further graduate work in their respective fields of interest.

Following are additional examples of employment agencies and industries and the careers which they offer.

The agricultural industries, feed and fertilizer manufacturers, food processors, cooperatives, and banks, employ graduates as price analysts, farm appraisers and managers.

State planning and recreation agencies, soil conservation services, the cooperative extension services, and private research firms employ rural and urban planners, hydrologists, conservation experts, resource development economists, nurserymen, and landscape gardeners.

The Peace Corps, and the Foreign Agricultural Service, hire farm production experts, soil and water managers, market analysts, agricultural engineers, teachers, plant and animal breeders, and nutrition specialists.

The Federal Government and state agencies, universities, health services, and private foundations employ biochemists, geneticists, animal nutrition specialists, plant and animal pathologists and physiologists, veterinarians, foresters, home economists, and entomologists.

Academic Requirements

For the Bachelor of Science degree a total of 128 credits are required. In addition the student must complete the University academic requirements found on page 65 and obtain a written recommendation for graduation from his adviser and department chairman.

Agricultural Education

The Agricultural Education curriculum provides for both a basic and liberal college preparation for students who plan to teach agriculture or seek employment with the Cooperative Extension Service as agricultural or 4-H youth agents. Graduates also find employment in specialized positions with industry or in education where a broad background of technical and professional skills is needed for sales, promotional, administrative, or research activities.

Students in this curriculum satisfy state teacher certification requirements by participation in the one semester education block program of off-campus teaching. Students who wish may arrange participating experiences with County Cooperative Extension personnel in a county office.

Students desiring to major in this curriculum should consult with the professor in charge before the end of the sophomore year. Students who wish to minor in this curriculum should consult both the adviser in their major and the professor in charge of this curriculum early in their academic careers.

Animal Sciences

The animal sciences courses are offered to provide students fundamental scientific training in such specialized areas as genetics, physiology, nutrition, animal hygiene, processing, and management. The student also has an opportunity to further concentrate his studies in the fields of animal, dairy, or poultry science, or pre-veterinary medicine.

Outstanding graduates are qualified to pursue advanced study in preparation for college teaching, research, and responsible technical positions in industry and federal and state agencies. Students interested in production and processing can receive training as production managers, for positions in the feed or equipment industries, marketing organizations, breeding associations, sales and service work in allied industries, and other areas of the diversified animal industry.

The department maintains Morgan horses for all phases of class work including riding. Herds of Shorthorn, Hereford, and Angus cattle and Yorkshire

swine and a flock of Dorset sheep are maintained.

The nationally recognized dairy herd, consisting of registered Ayrshire, Guernsey, Holstein, and Jersey animals, is housed in a new dairy barn. The Ritzman Animal Nutrition Laboratory includes bomb calorimeters, metabolism stalls for digestion studies, respiration chambers for heat production measurements, and other facilities used in nutrition teaching and research with both farm and laboratory animals.

Completed new poultry farm facilities are for instruction and for research and include laboratories for both teaching and research in poultry genetics, nutrition, and management.

Laboratory facilities, including such modern equipment as ultra centrifuge, amino acid analyzer, and gas chromatograph, are available in Nesmith Hall to provide the latest scientific training in the field of animal hygiene.

The department works closely with the New Hampshire animal industry and frequent class trips are made to leading farms, industrial concerns, processing plants, etc., where opportunities are presented for viewing industry in action.

Students who contemplate veterinary medicine as a career should confer early with the adviser to pre-veterinary medicine students. It should be noted that all veterinary colleges give first preference for admission to applicants from their respective states. Out-of-state students who are admitted must show above average scholastic ability. It is desirable that applicants to colleges of veterinary medicine have some farm experience, and, in fact, it is a prerequisite for admission to some.

Biochemistry

Biochemistry is the study of the chemistry of living things and of life processes. A student majoring in biochemistry will receive a fundamental training in chemistry, including courses in general, analytical, organic, and physical chemistry. An equally broad program in biological sciences is recommended. In addition to training in biochemistry, including an opportunity to participate in basic research during the senior year, students may select courses in botany, zoology, microbiology, and genetics.

The curriculum is designed to provide a strong foundation either for technical positions in universities, experiment stations, research institutes, and industrial or government laboratories or for graduate study in the natural sciences or in medicine. Excellent opportunities for teaching and research in biochemistry are available to students who earn graduate degrees in this very rapidly growing field of science.

A student who wishes to major in this department should register for Chemistry 405-406 and for Mathematics 425-426 in the freshman year. Students having an interest in biochemistry are advised to consult with Professor Edward J. Herbst, Chairman of the Department.

Botany

The program of the Botany Department is directed toward the understanding of plants and their relevance for human affairs. Students who pursue instruction in botany usually continue their training beyond the bachelor's degree for graduate work. Career opportunities exist mainly in government research and extension positions, secondary school teaching for which education training is desirable, university teaching and research careers, and industrial applications.

Students at this University usually concentrate on botany courses after the freshman and sophomore years of instruction have given them the broad background in the humanities, social sci-

ences, and physical sciences necessary for an understanding of plant function. Specialization usually begins in the senior year. The department offers a wide range of courses in the following areas: (1) plant physiology, the study of plant function with such practical applications as plant nutrition and requirements for growth; (2) phycology and biological oceanography, a study of algae, their morphology, life history, classification, and ecology; (3) cytology, the structure, physiology, and development of cells; (4) ecology, the relationships of plants within their environment; (5) plant pathology, a study of plant diseases, their causes, and control; (6) systematic botany, the identification and classification of plants in accord with their evolutionary relationships; (7) anatomy and morphology, a study of the structure, development, and cellular organization of plants, including microscopic techniques.

Students interested in becoming botany majors, whether at the beginning of their college careers or already enrolled in the University, are invited to discuss their interests with Dr. Thomas Furman, Chairman of the Department.

Entomology

Entomology offers courses for students who wish to specialize in the study of insect life, insect control, and insects in relation to man. There are opportunities for employment in a number of federal and state agencies, in public institutions, and with commercial and industrial firms. Many opportunities exist in the areas of crop protection, forestry, conservation, and in public health.

Students are given a fundamental training in entomology and related fields. Qualified students planning a professional career in entomology are encouraged to undertake graduate study. Those who wish to specialize in chemical control of insects will be expected to take advanced courses in mathematics and chemistry.

Students contemplating a career in entomology are advised to consult with the Chairman of the Entomology Department.

General Studies

This curriculum is offered for the student who wishes to secure a broad nonspecialized background in several areas related to the college without specializing in any particular department. After completing the University course requirements the student may select courses to fit his specialized or general interests. A student transferring from one major to another may wish to register in the General Studies curriculum until his educational objectives have been more clearly defined or a student may complete his work for the Bachelor of Science degree in the General Studies curriculum.

Home Economics

The objectives of the program in home economics are to provide, through the facilities of the University, a broad general education in the social and natural sciences, the humanities and the arts, and to provide specialized instruction based on these disciplines, as preparation for professional careers in which the interests and well-being of the individual, the consumer, and the family are paramount.

The focus of the department is the strengthening and enrichment of individual and family living through a curriculum to prepare specialists in family studies to work in schools, day care centers, adult education programs, family and community agencies, hospitals, and consumer services, and to provide

educational opportunities in family studies as part of general education for any University student.

The department provides professional preparation through two major programs, open to men and women:

1. Family Studies — professional programs in preparation for secondary school education,* pre-school education, family services, and consumer services.

2. Human Nutrition and Dietetics — to prepare students for a dietetic internship upon successful completion of the undergraduate requirements for the Bachelor of Science degree.

The department has been approved by the New Hampshire State Board of Education, Division of Vocational and Technical Education, for the preparation of secondary school teachers in vocational home economics and family life programs. The program in human nutrition and dietetics has been approved by the American Dietetic Association.

A candidate for the degree of Bachelor of Science in Home Economics completes 32 courses or the equivalent of 128 credits, distributed as follows: University general education requirements, 16 courses or 64 credits (see page 65); professional or specialized education, 16 courses or 64 credits. The latter must include a minimum of 9 courses or 36 credits in home economics, 3 courses or 12 credits in social or natural sciences, and 4 courses or 16 credits of professional preparation to meet certification standards for secondary school teaching, ADA requirements for a dietetic internship, or other specific objectives.

The 9 courses in home economics are to be selected as follows:

Group 1 — a minimum of 3 courses from 462, The Family in Societal Change; 465, Man in Families; 525, Human Development; 557, Consumer Education; 683, Family Relations.

Group 2 — a minimum of 3 courses from 514, Textiles; 573, Human Nutrition; 583, The Young Adult; 615, Specialized Clothing Construction; 626, The Young Child; 627, Creative Activities in Pre-School Programs; 657, Management and Decision-Making in the Family; 671, Introduction to Food Science; 715, Clothing in Relation to Human Behavior; 754, Personal and Family Finance; 776, Nutrition — a World View; 786, Dynamics of Family Change.

Group 3 — a minimum of 3 courses from any home economics courses, including seminars, field experience, independent study, methods, practicum. These courses should be related to the student's interest and objectives.

To fulfill the social or natural sciences requirement, a minimum of 3 courses are to be selected from one of the following groups: psychology, 500 level or above; sociology, 500 level or above; biological and physical sciences, 500 level or above.

A program of study will be required for particular professional areas, such as secondary-school teaching, dietetic internship, teaching in pre-school programs, family services, and consumer services. These programs are available upon request from the department.

Workshops for skill development in areas such as clothing construction, food preparation, management techniques, creative activities, and demonstration techniques will be available regularly on a non-credit basis.

A junior or senior may attend the Merrill-Palmer Institute in Detroit for one semester with full transfer of credit. This program is designed to give students a theoretical knowledge and understanding of human development and the family and to provide practicum training for students preparing to work professionally in various capacities with individuals, families, and groups.

Plant Science

Students interested in plants and their use for food, feed, fiber, recreation, or

ornamental purposes may take a major or minor in plant science. Because of the diversity of employment possibilities, the plant science major curriculum is flexible. Students first obtain a basic knowledge of physical and biological sciences. Selected courses then relate these sciences to the individual's interest in science, management, or agribusiness.

Students preparing for advanced study would take additional course work in chemistry, physics, and mathematics. These provide an excellent foundation upon which the student can build his research or teaching career.

Management encompasses production, management, and marketing of commercially important crops. Within this area, students will find opportunities in management of farms, greenhouses, golf courses, or nurseries, on state park or highway planning commissions, and with food and feed processing firms. Students specializing in management would select production and applied courses beyond the basic core of study.

Agribusiness exposes the student to more courses in marketing, economics, accounting, and business procedures while still retaining the fundamental requirements in plant science. Specialization in this area would prepare students for sales and brokerage positions in wholesale or retail marketing or for positions in industry.

Students interested in a plant science major or minor may consult with the Department Chairman, Professor L. C. Peirce.

Resource Economics

This department offers courses in resource economics, including public resource policy, resource management, conservation economics, and regional economics; and agricultural economics, including farm management, food marketing and consumption, agricultural price policy, and world food supplies.

The student in resource economics is trained primarily in the science of economics and its use in problem-solving by individuals, households, business firms, and administrators of governmental agencies. In addition, the student is encouraged to take courses which will lead to a broad university education. Majors concerned with the conservation and use of natural resources should take courses in the departments of Forest Resources, Soil and Water Science, and Geography. Those majors who are interested in the economic or business aspects of agriculture will be expected to take courses in the departments of Animal Sciences and Plant Science. All majors in resource economics will be expected to take some selective courses in the Whittemore School of Business and Economics.

Many students majoring in the various social science and agricultural departments of the University may find it to their advantage to elect some courses or a minor in resource economics. In this manner their basic training can be supplemented in a specific area of interest, such as farm management and agricultural marketing for agricultural majors and resource development, and natural resource policy for social science majors.

Students who major in resource economics are qualified for a wide variety of opportunities upon graduation. There is presently a strong demand by private business, public institutions, and government agencies for specialists trained in agricultural, fisheries, and forestry marketing; conservation, resource development, and land use policy; agricultural extension, resident teaching; and for farm managers.

In many cases the student may wish to further his education and improve his qualifications by pursuing more specialized graduate studies in one or more of the above areas.

Soil and Water Science

The subject matter of this program may be classed in both the biological and earth sciences. It includes knowledge of the outermost layer of the earth's crust and that portion of the hydrologic cycle pertaining to the fate of water falling on the earth's surface. Knowledge concerning soil and water is important to persons working in the plant sciences, geology, geography, meteorology, and certain aspects of engineering. Students interested in soil and water science may select one of the two majors described below.

Soil Science: This curriculum helps the student develop an understanding of the nature and properties of soils. It includes the study of the chemical and physical properties of soils, their formation, classification, conservation, and management. Soils are evaluated as a resource in urban and rural community planning. Students obtain a background in the physical and biological sciences as part of their training as soil scientists. Graduate majors find jobs in industry as research specialists in such areas as agricultural chemicals and soil engineering; in Federal Civil Service positions with such groups as the Agriculture Research Service, Soil Conservation Service, and Soil Survey; as consultants on resource planning boards; and in foreign service with such groups as the Peace Corps and other technical assistance programs. Those who continue their education and obtain advanced degrees find professional positions available in University teaching and research.

Hydrology: This is the science underlying development and control of water resources on and beneath the earth's surface. Sciences closely related and basic to the analysis and understanding of water in the hydrologic cycle are meteorology, soils, geology, plant ecology, physics, and chemistry. Because water is a basic requirement of life, it has social, economic, and political significance throughout the world. As the population of the world grows and as industrial, recreational, agricultural, and residential needs for water increase, greater emphasis will be placed on the study and understanding of problems associated with water resources.

Employment opportunities are found with various federal and state agencies, private industry, public utilities, recreation groups, community or regional resource planning boards, and international organizations. Scientific or educational institutions also offer opportunities for those who go on to take advanced degrees in hydrology or related fields.

Wildlife Management

This curriculum is for students whose interest is in the production, management, and utilization of game and other forms of wildlife. It is designed to provide a knowledge of wildlife species and of the total forest and field environment of which they are a part. It prepares the student for work with public and private agencies in wildlife management and is a base for graduate study as needed for research and teaching.

Field work is carried out during the academic year on wildlife areas near the campus. In June each year, a two-week session is held for all students who have completed the sophomore year. There is no additional summer camp. Majors are encouraged to obtain summer employment related to their career objective.

The degree earned is a Bachelor of Science with a major in wildlife management. The program is administered in the Department of Forest Resources and is a cooperative program with the departments of Animal Sciences, Forest Resources, and Zoology. Inquiries should be addressed to the Department of Forest Resources, Pettee Hall.

In addition to the normal University fees and tuition, forestry students are required to meet transportation and meal charges in connection with regularly planned field sessions.

Students majoring in wildlife management are required to complete 132 credits for the bachelor degree. In completing the curriculum which follows, the student will meet the University general education requirements (see page 65). These requirements should be met by choosing electives from the following: four courses in arts, humanities, or social sciences; and four courses from the other University requirements. In addition, two electives should be chosen from the following: Forest Resources — 544, Forest Economics; 629, Silviculture; 643, Forest Biometrics; 702, Natural Resources Policy; 712, Sampling Techniques; 745, Forest Management; 763, Forest Recreation Seminar; Soil and Water Science — 501, Introductory Soils; 502, Soil-Plant Relationships; 507, Introductory Hydrology.

FRESHMAN YEAR		SEMESTER	CREDITS
Bot. 411	General Botany	4	
Zool. 412	Principles of Zoology		4
For. Res. 425	Dendrology	4	
Math. 420	Fundamental Mathematics		4
Eng. 401	Freshman English	4	
Econ. 401	Principles of Economics		4
	Elective	4	4
		16	16
SOPHOMORE YEAR			
An. Sci. 501	Animal Anatomy and Physiology	4	
For. Res. 635	Contemporary Conservation Issues	4	
Chem. 403-404	General Chemistry	4	4
For. Res. 528	Applied Statistics I		4
Zool. 512	Ornithology		4
	Elective	4	4
		16	16
SPRING FIELD SESSION (JUNE)			
For. Res. 542	Forest Land Surveying	2	
		2	
JUNIOR YEAR			
Biochem. 501	Biological Chemistry	4	
Zool. 712	Mammalogy	4	
Zool. 601	Principles of Ecology	4	
For. Res. 634	Wildlife Ecology		4
An. Sci. 614	Disease and Parasites of Wildlife		4
Pol. Sci. 406	Principles of American Government		4
Math. 401	Computer Programming	2	
	Electives	4	4
		18	16

SENIOR YEAR		SEMESTER	CREDITS
For. Res. 737, 738	Game Management	4	4
Zool. 711	Natural History of Cold-Blooded Vertebrates	4	
Zool. 796	Fishery Biology		4
	Electives	8	8
		16	16

Bachelor of Science in Forestry

The primary objectives of this program are to develop the student as a person and as a professional forester. Graduates are employed in all phases of forest land administration, in many aspects of natural resource protection and utilization, and in maintenance of environmental quality. Production of raw materials from the forest occupy some foresters, but many are also concerned with wildlife, grazing, watershed and recreation.

Managerial and administrative skills are required of most forestry graduates. The curriculum gives a strong foundation on both biological knowledge and managerial skill, with elective freedom for the student to cultivate his special abilities and interests. The curriculum leads many students into further graduate studies.

Field work is carried out during the academic year on University woodlands adjacent to the campus. In June each year, a two-week field session is held for all students who have completed the sophomore year. There is no additional summer camp. Majors are assisted and encouraged to obtain summer employment related to their career objective.

In addition to the normal University fees and tuition, forestry students are required to meet transportation and meal charges in connection with regularly planned field sessions.

The Department of Forest Resources is accredited by the Society of American Foresters.

Information on the undergraduate program leading to a Bachelor of Science with a major in wildlife management will be found on page 73.

Students majoring in forest resources are required to complete 134 credit hours for the degree of Bachelor of Science in Forestry. In completing the curriculum which follows, the student will meet the University general education requirements (see page 65). These requirements should be met by choosing electives from the following: one course in a science; four courses in arts, humanities, or social sciences; three courses from the other University requirements; and four courses selected from a list available from the adviser to follow the direction of professional interest of the student.

FRESHMAN YEAR		SEMESTER	CREDITS
For. Res. 425, 426	Dendrology; Wood Technology	4	4
English 401	Freshman English	4	
Botany 411	General Botany	4	
Math. 415 or 425	Fundamental Math	4	
Economics 401	Principles of Economics		4
Advanced English	Writing or Speaking Development		4
Elective			4
		16	16

SOPHOMORE YEAR		SEMESTER	CREDITS
For. Res. 527, 528	Silvics, Applied Statistics	4	4
S & W 501	Introductory Soils	4	
Entomology 506	Forest Entomology		4
Bus. Adm. Elective			4
Elective		8	
For. Res. 544	Forest Economics		4
Math. 401	Computer Programming	2	
SPRING FIELD SESSION (June)			
For. Res. 542	Forestland Surveying		2
		18	16

JUNIOR YEAR			
For. Res. 629	Silviculture	4	
For. Res. 643	Forest Biometrics	4	
Bot. 753	Forest Pathology	4	
Elective		4	16
For. Res. 660	Forest Protection		2
		16	18

SENIOR YEAR			
For. Res. 745	Forest Management	4	
For. Res. 746	Forest Resources Management Seminar		4
For. Res. 753	Operations Control and Analysis	4	
For. Res. 754	Wooh Products Manufacturing and Marketing		4
Elective		8	8
		16	16

Thompson School of Applied Science

Philip S. Barton, *Director*

The Thompson School is the two-year division of the College of Agriculture. It offers programs of study on the technician level. High school graduates with satisfactory grades and a real interest in furthering their education are admitted.

Two years of academic work on campus, totaling 64 semester credits, plus completion of one summer of supervised placement, lead to the degree of Associate in Applied Science.

The Thompson School offers the following curriculums: applied animal science; commerce technician, food service management; forest technician, general; applied plant science; soil, water and construction technician.

Applicants desiring admission in the forest technician and soil, water, and construction technician curriculums must submit two units in college preparatory mathematics. Applicants for admission in the other curriculums will find biology, chemistry, and mathematics helpful prerequisites for courses in the plant and animal sciences. Each prospective applicant must take the College Board Scholastic Aptitude Test during his senior year in high school.

A catalog may be obtained from the Thompson School of Applied Science, Putnam Hall, University of New Hampshire, Durham, New Hampshire 03824.

College of Liberal Arts

Eugene S. Mills, *Dean*
Melville Nielson, *Associate Dean*
Warren H. Held, *Associate Dean*
Mrs. Claire Wright, *Academic Counselor*
L. Jackson Newell, *Assistant to the Dean*

Departments

The Arts
Education
English
French and Italian
Geography
Geology
German and Russian
History
Microbiology
Music
Philosophy
Political Science
Psychology
Sociology
Spanish and Classics
Speech and Drama
Zoology

Division of Health Studies

Nursing
Occupational Therapy
Physical Education for Men
Physical Education for Women

Cooperating Departments

COLLEGE OF AGRICULTURE:
Botany
Entomology

COLLEGE OF TECHNOLOGY:
Chemistry
Mathematics
Physics

Programs of Study

BACHELOR OF ARTS:

The Arts
Biology
Botany
Chemistry
Chemistry and Physics
Classics
Earth Science
Elementary Education
English
English Teaching
Entomology
French
General Physical Science
Geography
Geology
German
Greek
History
Latin
Mathematics
Microbiology
Music
  Music History
  Performance Study
  Music Theory
Philosophy
Physics
Political Science
  International Relations
Psychology
Social Service
Sociology
Spanish
Speech and Drama
  Communications
  Theater
  Communication Disorders
Zoology

BACHELOR OF SCIENCE:

Art Education
Medical Technology
Music Education

BACHELOR OF MUSIC:

Piano
Organ
Voice
Strings, Woodwind, Brass or Percussion
Theory

SUPPLEMENTAL NON MAJOR PROGRAMS:

Pre-Dental
Pre-Law
Pre-Medical
Teacher Preparation Program

BACHELOR OF SCIENCE:
DIVISION OF HEALTH STUDIES

Nursing
Occupational Therapy
Physical Education for Men
Physical Education for Women
Recreation and Parks

General Information

Purpose and Objectives

It is the purpose of the College of Liberal Arts, as a center of learning and scholarship, to help all of its members achieve an understanding of the heritage of civilization and to educate them in the tradition of the past and the realities of the present so that they may recognize and act upon their obligations to the future.

The College endeavors to meet the educational needs of each student through the development of interests and skills which, combined with the student's potential, makes possible the living of a richer and more useful life.

Programs of Study

The College of Liberal Arts offers three degrees: Bachelor of Arts, Bachelor of Science, and Bachelor of Music.

The *Bachelor of Arts* program is intended primarily to provide a broad liberal education along with a major in one of the fields listed above. Requirements for the Bachelor of Arts degree, and information regarding these majors, are presented in the section entitled Bachelor of Arts Program.

The *Bachelor of Science* curricula consist of several programs of study which are intended to provide preparation for professional life. They are arranged in such a manner as to permit considerable specialization while providing a broad cultural education for the students enrolled in them. Bachelor of Science curricula are offered in the fields listed above. Requirements for the Bachelor of Science degree, and information regarding these curricula, are presented in the section entitled Bachelor of Science curricula.

The *Bachelor of Music* curriculum is designed to provide professional training in applied music and in musical theory, and to allow students to develop their talent to the equivalent standard of that offered by conservatories of music. Requirements for the Bachelor of Music curriculum, and information regarding this curriculum, are presented in the section entitled Bachelor of Music curriculum.

Although the University will try to provide sufficient facilities so that a student may pursue any major or curriculum for which he meets the requirements, such a privilege cannot be guaranteed. Rapidly increasing enrollment sometimes results in crowding required specialized courses beyond capacity. On occasion, a student may remain in a crowded curriculum if he is willing to take certain courses during the summer session.

Combined Programs of Study

In addition to pursuing a single major, a student in the College of Liberal Arts may combine programs of study as follows:

Minor Option

He may earn a minor in any undergraduate discipline in the University in which permission to do so can be arranged by the student in consultation with his major adviser. A minor consists of 20 semester hours with C or better in subjects that the minor department approves. No more than 8 credits used by the student to satisfy requirements in his major may be used for his minor. He should declare his intent to earn a minor as early as possible and no later than the end of his junior year. During his final term he should apply to the Dean to have the minor shown on his transcript.

Dual Major Option

He may earn two majors in any disciplines awarding the Bachelor of Arts degree. No more than 8 credits used to satisfy requirements for one major may be used for the other. A student should declare his intent to earn two majors as early as possible and no later than

the end of his junior year. He should plan his program in consultation with advisers from both majors.

Dual Degree Programs

The purpose of the two-degree program is to broaden the education of certain students at the undergraduate level. The program is only for those students who can adequately handle the requirements for two different degrees and who can reasonably allocate the additional time and effort needed for the dual program.

A candidate for two degrees must complete all the curriculum, departmental, scholastic, and other requirements for each degree. It is expected he will complete five years of academic work. He may not earn a second degree in the same or closely allied major field.

If a student plans to take one of the two degrees in the College of Technology, he should register as a freshman in that College. If he does not plan to include a Technology degree in his program, he may register in any of the other three Colleges. When a student is accepted as a two-degree candidate, supervisors for each major will be appointed. These supervisors will maintain joint control over the student's academic program. Students who wish to be in this program should confer with the appropriate college dean(s), preferably no later than the end of the freshman year.

Supplementary Programs of Study

Although pursuing his studies in the College of Liberal Arts in one of the listed fields, the student may also prepare himself for some related objectives. Two of these are described below, and there is enough freedom of election to make it possible for the student to arrange others.

Pre-Medical and Pre-Dental

Students who plan to enter a school of medicine or dentistry may elect to major in almost any field offered under the Bachelor of Arts program, but will, of course, need to include all courses specifically required for admission to the professional school. The faculty of the College has established a Pre-Medical Advisory Committee to handle the advisement of students and to formulate recommendations to colleges of dentistry and medicine.

Students who have a real interest in either dentistry or medicine should contact Professor Paul E. Schaefer, Spaulding 207, early in the freshman year or as soon as a decision is reached to pursue a professional career. The office of the Pre-Medical Advisory Committee keeps a file of information on the requirements of all medical and dental colleges of the United States and Canada, plus other pertinent information concerning admission to such schools. Today most colleges of medicine require the Medical College Aptitude Test and a composite recommendation. Information and application forms for the MCAT and the Dental Aptitude Test are available in the office of the committee.

In order to assure adequate information for the composite recommendation, all students who plan to apply to a medical or dental college must register with the Pre-Medical Advisory Office no later than the first semester of the sophomore year.

Pre-Law

While the various bar associations and law schools do not prescribe a specific undergraduate curriculum for future lawyers, they recommend that a student who contemplates entering law school should plan a study program which will develop breadth of view and facility of expression. They also urge him to acquire a background of information concerning the society in which he lives and the forces which have shaped modern institutions. They urge him particularly to perfect his use and understanding of the English language in writing and speaking.

The courses considered most helpful are those which develop oral and written expression, deal with man's social, economic, and political institutions, provide an understanding of the human mind, and develop the art of thinking. A course in the elements of accounting may be useful.

Most law schools require the Law School Admission Test of students seeking admission; each law school will advise a student upon request whether or not he will be expected to take the test in partial satisfaction of admission requirements. Particulars of the examination may be obtained at the office of the Department of Political Science.

Students who plan to enter law school after graduation are advised to consult with the Chairman of the Department of Political Science as soon as they have made their decision, preferably in the sophomore year.

Preparation for Teaching

The University offers two undergraduate programs for teacher education — one for secondary-school teacher preparation and one for elementary-school teacher preparation.

Both teacher education programs are selective. For the details about the standards of selection, see the prerequisites for the courses in education.

Secondary-School Teacher Preparation Program

All students preparing to teach in secondary schools follow a basic professional secondary-school teacher preparation program. Education 481 and 657 are taken before the student teaching block semester. The block semester contains four courses: Education 658, Education 659, Education 694, and a 691 special methods of teaching course offered by the student's major department. The block semester is taken during one semester of the senior year, the semester being determined by the student's major field of study.

A student is admitted to the student teaching block semester upon approval of the Department of Education and of his major department. A cumulative grade point average of 2.2 or better and a major subject grade point average of 2.5 or better are required for admission to the block semester. Application for admission to the student teaching block semester is made through the Coordinator of Secondary Student Teaching during the week of February 14, the semester preceding the academic year during which student teaching will be done.

Secondary- school teacher preparation programs in art, music, men's physical education, women's physical education, and home economics vary slightly from the basic pattern described above. A student preparing to teach one of these subjects should consult early with his major adviser in planning his teacher preparation program.

A student in the secondary-school teacher preparation program does not major in the Department of Education. He majors in a subject-matter department. A student interested in the program should consult with his major subject adviser and with the Coordinator of Secondary Student Teaching.

Elementary School Teacher Education Program

Students planning to teach in elementary schools will declare elementary education as their major. Information about this major is presented in the section entitled Bachelor of Arts Program.

Elective Courses in Education

Two courses in education are designed to be of interest to the general student as well as to the prospective teacher. Courses in educational psychology (Education 481) and psychology of human learning (Education 657) are substantive rather than procedural and thus are appropriate for any student who wishes to get a better understanding of the process of education.

Student Teaching

Students in both the elementary-school teacher preparation program and the secondary-school teacher preparation program student teach in public schools in the vicinity of the University. Student teachers work with cooperating teachers selected jointly by public school administrators and members of the University faculty. Each student teacher is supervised by his cooperating teacher and a member of the Department of Education. Each student teacher in the secondary-school teacher preparation program is also supervised by a member of his major department. Students in the elementary education program usually are placed in teams of two in order to encourage interaction.

Each student teacher ultimately assumes full teaching responsibility for one or more of his cooperating teacher's classes after a period of observation, planning, and service as a teacher aide.

Accreditation and Certification

The teacher preparation programs of the University are accredited by the National Council for the Accreditation of Teacher Education, for the preparation of elementary teachers, secondary teachers, and school service personnel, with the master's degree as the highest degree approved.

Completion of the approved teacher preparation program of the University qualify a student for certification as a teacher in most states. There are a few which have unusual requirements for certification. The Chairman of the Department of Education will be glad to advise students regarding these requirements.

Honors Program

The College of Liberal Arts offers an honors program as a possible means of challenging students of exceptional ability.

This program has three divisions: 1. Honors offerings for each of the freshman and sophomore years. At present this applies only to English and History. 2. Departmental honors programs, developed and administered by those departments choosing to maintain an honors program. 3. An upper-division, general honors program with two objectives: first, to provide an honors minor program for those students who wish to do honors work but whose major departments do not maintain honors programs; and second, to schedule special lectures, seminars, and other academic activities for all honors students. Students desiring information about a department's program should consult the department chairman.

The upper-division general honors offerings provide continuity with the freshman-sophomore honors curriculum. Should independent study be involved in such a program, a junior may register for a total of 8 credits of independent study and a senior for a total of 12 credits during the academic year. This work would be done in the 695, 696 course in the relevant department, and in L.A. 695, 696 where the department has no such offering.

The honors minor program gives an honors option to a student majoring in a department not maintaining an honors program, and may be undertaken by such a student with the approval of his departmental supervisor, the Honors Council, the Dean, and a council member teaching the subject in which the minor would be undertaken. The council member supervises the student's activities.

It is expected that all honors students will maintain a cumulative average of at least 3.0.

The Ford Foundation Program

A limited number of juniors are selected each year from those who apply for a special three-year program leading to the B.A. and M.A. degrees. The program is limited to superior students who expect that their chosen vocation shall be teaching at the college level. The

regular requirements for the B.A. degree and the Graduate School requirements for the M.A. degree are basic requirments. In addition the student is expected to attend a special seminar in the junior year and to engage in independent study in the senior year. During the graduate year of the program, he will be assigned to his major department as an intern in teaching.

Students should apply during their sophomore year. Further information may be obtained from the director of the program, Professor G. Harris Daggett, Department of English.

Bachelor of Arts Program

The Bachelor of Arts Program provides a broad liberal education with a concentration involving a minimum of 32 credits (typically 8 courses) in a major field.

Degree Requirements

Satisfaction of these requirements ensures satisfaction of the University general education requirements.

These requirements apply to all students who enter the College of Liberal Arts between July 1, 1969 and June 30, 1970, and are seeking a Bachelor of Arts degree. (Students who entered the College at an earlier time may apply for a change to the requirements of this catalogue.)

1. 128 credits (typically 32 courses).

2. At least a 2.0 cumulative average in all courses completed at the University of New Hampshire.

3. The University physical education requirement.

4. English 401 (to be completed in the freshman year).

5. Four courses in sciences and/or mathematics from those offered in biochemistry, biology, botany, chemistry, entomology, geology, mathematics, microbiology, physical science, physics, and zoology, *outside the major department.*

6. Two courses in humanities, selected from those offered in arts, English (beyond 401), foreign languages (beyond 401-402), humanities, liberal arts, music, philosophy, speech and drama, *outside the major department.*

7. Two courses in social sciences from those offered in anthropology, economics, geography (excluding physical geography), history, political science, psychology, sociology, or social science, *outside the major department.*

8. Two additional humanities *or* social sciences courses, *outside the major department.*

9. Six additional courses, not in a student's major department, selected from all courses offered by the University, will fulfill Catagory C of the University general education requirements. English 401 must be included in these six courses. Students exempted from English 401 must substitute a course, *not in the major department,* to make up a total of six courses in this category.

10. Foreign Language Requirement: Proficiency in a foreign language at the level achieved by satisfactory work in a one-year college level course is required of all students. This requirement may be fulfilled by achieving a satisfactory score on College Board tests or by completing one of the 401-402 series in any foreign language sequence at the University of New Hampshire. Students having studied a foreign language for two or three years in high school should be able to achieve a satisfactory score on College Board tests. Placement in advanced courses in foreign languages by College Board tests or by any other approved procedure, including transfer, satisfies this language requirement.

11. Major Requirements: A student must complete at least 32 credits of major course work with grades of C or better. The major department may specify certain (but not more than 13) required courses which constitute a major, and may require a senior paper or project, and/or a comprehensive examination.

(In majors where courses in the Secondary School Teacher Preparation program are required, these courses are *not* counted in the maximum of 13 allowed.) These requirements are given in the listing of majors that follows. A major must be selected prior to the beginning of the junior year.

Majors in the Bachelor of Arts Program

The objectives, opportunities, and department requirements of majors in the Bachelor of Arts program are described in the paragraphs which follow.

The Arts

It is the belief of the Department of The Arts that art is best taught with a practical center. The Student Workshop, a facility for creative exploration, and a continuing series of exhibitions of art contribute to the realization of this objective. The courses offered provide an opportunity, within the liberal arts framework, for the serious art student to acquire a thorough knowledge of the basic means of visual expression. In addition, these courses are designed to offer foundation experience for students interested in art but who are majoring in other departments in the University.

All students majoring in The Arts must complete with the grade C or better a minimum of eight courses (32 credits), of which the following are required: Arts 431, Basic Design; Arts 432. Drawing; Arts 475-476, Introduction to The Arts. Of the remaining four courses, two must be of an intermediate or advanced level (i.e., courses numbered 500 or above).

While the above represents the minimum departmental requirements, a student may wish to plan a program involving greater depth in one or several of the areas in the department, i.e., ceramics, history of art, metal and jewelry, painting, drawing, and graphic arts, photography, sculpture, weaving, woodworking.

A major adviser in the area of the student's interest will be selected. Students who are interested in majoring in The Arts should consult first with the Department Chairman.

Biology

The biology major is intended for students planning to teach in secondary schools. Completion of the biology major will generally *not* qualify students for admission to graduate schools, either to pursue graduate work in biology or in any of its sub-disciplines. Students interested in pursuing various aspects of biology will find majors in botany, microbiology, entomology, and zoology in the College of Liberal Arts, and in wildlife management (administered by the Department of Forest Resources) in the College of Agriculture.

As few positions are available in any year for teaching biology alone, a student should include courses in his program of study which will qualify him for teaching other sciences.

The minimum course requirements are as follows: Chemistry 403-404; Biochemistry 501 or Chemistry 545; Physics 401 or 405; Botany 503; Botany 506 or 742 or 756; Entomology 402; Microbiology 503; Zoology 412, 507-508, 604; Biology 641. Students must also complete all courses in the Secondary School Teacher Preparation Program. At least 32 credits of biology courses (biology, botany, microbiology, entomology, zoology) must be completed with a grade of C or better.

Students interested in majoring in biology are advised to consult with the supervisor, Professor Paul E. Schaefer, Department of Zoology.

Botany

The program of the Botany Department is directed toward the understanding of plants and their relevance for human affairs. Students who pursue instruction in botany usually continue their training beyond the bachelor's degree for graduate work. Career opportunities ex-

ist mainly in government research and extension positions, secondary-school teaching for which education training is desirable, university teaching and research careers, and industrial applications.

Students at this University usually concentrate on botany courses after the freshman and sophomore years of instruction have given them the broad background in the humanities, social sciences, and physical sciences necessary for an understanding of plant function. Specialization usually begins in the senior year.

The department offers a wide range of courses in the following areas: (1) plant physiology, the study of plant function with such practical applications as plant nutrition and requirements for growth; (2) phycology and biological Oceanography, a study of algae, their morphology, life history, classification and ecology; (3) cytology, the structure, physiology and development of cells; (4) ecology, the relationships of plants within their environment; (5) plant pathology, a study of plant diseases, their causes and control; (6) systematic botany, the identification and classification of plants in accord with their evolutionary relationships; (7) anatomy and morphology, a study of the structure, development, and cellular organization of plants, including microscopic techniques.

Students interested in becoming botany majors, whether at the beginning of their college careers or already enrolled in the University, are invited to discuss their interests with Dr. Thomas Furman, Chairman of the Department.

Chemistry

Students who are interested in the study of chemistry will find opportunities in such fields as individual work involving the development of processes or production activities or sales work based on a scientific knowledge of the marketable products, the teaching of chemistry and allied subjects in secondary schools or of chemistry in colleges, and graduate study for those students who are interested and particularly proficient in their undergraduate work.

The University offers two channels for study of chemistry: majoring in the subject in the College of Liberal Arts, or enrolling in the prescribed curriculum in chemistry in the College of Technology. Students majoring in chemistry in the College of Liberal Arts may have a wide variety of interests and differing abilities in science.

In order to be well prepared for graduate school or a career in chemistry, each student should have the following courses as a minimum: Chemistry 405-406 *or* 403-404 and 521; 547-548; 762; 683-684; 685-686; and at least one chemistry course in each semester of the senior year; Physics 401-402 (Physics 407; 408; 505 desirable for the capable student); Mathematics 425-426. In order to meet American Chemical Society accreditation, the student should satisfy the foreign language requirement in either German or Russian. According to the student's interests, other supporting subjects may be elected to form a broad program of study and to prepare for one of the opportunities listed above.

The department is equipped to furnish the preparation necessary for teaching chemistry in secondary schools. As very few positions are available in any year for teaching chemistry alone, a student should consider a program of study which may qualify him for teaching chemistry and other sciences, and should consult with the chairman of the Department of Chemistry and the chairman of the Department of Education. Students who are interested in teaching chemistry in college are advised to plan on graduate study.

Students who plan to major in chemistry are advised to consult with Professor Alexander R. Amell of the Department of Chemistry as early in their college program as possible.

Chemistry and Physics

This major is designed for students who wish to teach chemistry and physics in secondary schools. The number of positions available for teaching only chemistry or physics is limited, and there are many opportunities to teach both subjects on the secondary-school level. Chemistry and physics majors will have good preparation for teaching these subjects and will have the necessary mathematics and education background.

Minimum course requirements for the major include: chemistry 405-406; 545; 683-684 or 786; 685-686; mathematics 425-426; physics 407-408; 505-506; 605; and all education courses in the Secondary School Teacher Preparation Program.

To be eligible for the required student teaching course, the major must have a cumulative average of 2.2, an average of 2.5 in the required chemistry and physics courses, and a 2.5 average in the required education courses.

Students interested in majoring in chemistry and physics should consult with Professor Michael D. Andrew of the Department of Education and with either Professor Alexander R. Amell of the Department of Chemistry or with Professor Robert E. Houston of the Department of Physics.

Classics

(See Spanish and Classics)

Earth Science

The major in earth science is specifically designed to provide a background for students planning to teach earth science in secondary school.

Students who major in earth science must complete the following minimum requirements with an average of at least 2.5: Geology 401-402, 501; Geography 473; Chemistry 401-402; Physics 406; either Physics 401-402 or Physical Science 401-402; 12 elective credits from intermediate and upper level Geology courses and/or Geography 570. Students must complete the courses in the Secondary School Teacher Preparation Program.

Students interested in a major in earth science should consult with Professor Herbert Tischler, Department of Geology, and with Professor Michael D. Andrew, Department of Education.

Elementary Education

Students planning to teach in elementary schools major in the Department of Education as elementary education majors. This major is an unusual one combining strong liberal arts preparation with a full year of professional study. For the first three years the student follows the Bachelor of Arts Program. Also recommended for elementary education majors is either Education 481 or Home Economics 425 (no additional education courses should be taken before entrance into the elementary educational block). In addition, it is recommended that elementary education majors take three courses (12 credits) in mathematics in the special 600 series. Elementary education majors must complete 20 credits in a minor subject.

Students should demonstrate a personality suitable for teaching, gain experience working with groups of children, and have a cumulative grade point average of at least 2.2. The entire senior year is devoted to professional study and student teaching by enrolling in Education 741-742, a 32-credit course. Students interested in this program should consult with Professor Deborah Stone or Professor Catherine Noonan as early as the sophomore year.

English

The Department of English offers two programs of study: the English major and the English teaching major.

The English major has two chief objectives: to provide for all students a basic variety of literary experiences and to provide for each student the opportunity of shaping a course of study to suit his individual interests. The flexi-

bility and freedom inherent in the second of these objectives place a responsibility upon the student to devise a program which has an intelligent rationale. For example, the student who intends to pursue graduate study in English literature should in most cases choose more than the minimum number of advanced literature courses required for the major. The student who intends to pursue a career in writing may, on the other hand, wish to elect only the minimum number of literature courses required for the major. (The student interested more specifically in journalism should note the descriptions of courses in nonfiction writing.) All students should secure the assistance and approval of their advisers in formulating an early plan for their entire major program.

For the English major, students must take one course (4 semester credits), in which they must earn a grade of C or better, from among the following: English 513, 514, 515, 516, 517, 519, 520. They must also take eight English courses numbered above 600 (32 semester credits), in which they must earn a grade of C or better. Of these eight courses, at least five must be in literature (i.e., not courses in writing, grammar, linguistics, or history of the language). Of these five courses in literautre, at least three must be in three different centuries before the nineteenth, and at least one must be in a major author (i.e., Chaucer, Shakespeare, Milton); the major author course may be counted toward the century requirement.

Students who intend to teach English in secondary school should normally enroll in the English teaching major. For this major, students must meet the state certification requirements for teaching. (For requirements in education courses, see section entitled Preparation for Teaching.) They must also take the following courses, which must be passed with an average of 2.5 or better: English 501, 513, 514, 516, 705 or 706, 709 or 710, 711, 757, Speech 403, and one additional English literature course numbered above 700. (Speech 508 may also be used toward the fulfillment of University general education requirements in the category of arts, humanities, and social sciences.)

Students who are interested in majoring in English should consult with the supervisor, Professor John Richardson.

Entomology

Entomology offers courses for students who wish to specialize in the study of insect life, insect control, and insects in relation to man. There are opportunities for employment in a number of federal and state agencies, in public institutions, and with commercial and industrial firms.

Students are given a fundamental training in entomology and related fields. Qualified students planning a professional career in entomology are encouraged to undertake graduate study. Those who wish to specialize in chemical control of insects will be expected to take advanced courses in mathematics and chemistry.

Students who major in entomology are expected to complete successfully courses offered by the department, to a total of 32 semester credits, with grades of C or better. Courses in other departments may be counted with the consent of the major supervisor.

Those contemplating a career in entomology are advised to consult with the Chairman of the Entomology Department.

French

The Department of French and Italian offers at the present time a major in French only. The supervisor for majors is Professor Louis J. Hudon.

A major consists of a minimum of 36 credits. French 401-402, 503-504, 505-506 and 514 do not count toward a major. French 605-606 and 790 are required of majors. The student will be encouraged to take courses in related fields, such as English, history, art, music, and philosophy.

A minor in French consists of 20 credits in French courses numbered 503 and above.

The Department also offers a junior year abroad at the University of Dijon. This program is open to all qualified students at the University of New Hampshire. See Description of Courses, French 685-686.

General Physical Science

A student having broad interest in physical science, but no professional objective in any one of the recognized sciences in this field, may register as a General Physical Science major. Many students who have majored in General Physical Science have combined this specialization with courses in education leading to secondary school teacher certification.

Students majoring in general physical science must complete the following courses and achieve in them an overall grade point average of 2.3 or better. Mathematics 425-426; Chemistry 403-404 and 521; Geology 401-402; Physics 401-402; and any four of the following: Geography 473; 570; Geology 501; Mathematics 420; and Physics 406.

Students who are interested in choosing general physical science as a major should consult with Professor Herbert Tischler, Department of Geology. It is recommended that students who select this program as a basis for teacher preparation elect courses in the biological sciences and physical sciences in addition to those required by the major proper. Professor Michael Andrew, Department of Education, will be available to assist students in selecting these courses.

Geography

Geography satisfies man's ancient curiosity about distant places and, less exotically, his need for further knowledge of the "home area". Modern geography is best defined as the discipline that describes and analyzes the variable character from place to place of the earth as the home of man. As such, geography is an integrating discipline, studying many types of phenomena, both human and natural, that are significant to understanding the character of areas or the spatial organization of the world.

Because its integrating character establishes common areas of interest with many other fields of knowledge, geography is an excellent core discipline for a liberal education. Thus, students who have a primary interest in the spatial organization or the regional character of the world and who also desire a liberal education can attain these goals by majoring in geography. Those wishing to prepare for careers as professional geographers are advised to concentrate their course work in geography and closely related fields, and should plan to go on to graduate study after completing an undergraduate major in geography.

Today, as in the past, most professional geographers hold positions in educational institutions, and the demand for personnel in this field is increasing greatly. Revival of interest in geography on the part of primary and secondary schools also suggests increased opportunity for persons educated in geography. In addition, many geographers now find employment for their skills in various branches of Federal and state governments, in regional and urban planning, and in market research and plant location services for business and industry.

Students who major in geography are required to take Geography 401, 402, and seven additional courses in geography or related fields approved by their supervisor to a total of 28 semester credits with grades of C or better. The seven courses should include Geography 571, 572; 581, 582; 797, and two additional intermediate level courses in geography.

Students who are interested in majoring in geography should consult with the supervisor, Professor William H. Wallace.

Geology

The aim of the geological sciences is to reconstruct the physical and biological history of the earth by the study of the formative processes acting on the earth. Geology includes a study of the constituents that make up the earth, an understanding of the evolution of the earth's structural framework and surface features, an interpretation of changes in life and interrelations of the physical and the biological environment through time.

The need for men trained in the earth sciences has been emphasized by the search for essential mineral resources, the expansion of geological research especially in the marine sciences and in extraterrestrial geology, and by the demand for teachers of earth science in the secondary schools throughout the country. (See major in earth science.)

Positions as mining geologists, petroleum geologists, marine geologists, federal and state survey geologists, and university and college professors have been successfully filled by graduates of the University who have majored in geology. Other former major students are teaching in high schools or are in business where their geologic preparation has proven to be very useful.

Majors in geology are required to take 32 credits in geology or related fields with grades of C or better. Although the courses of each major program are selected to meet the needs of the individual student as determined by the student and his departmental adviser, the 32 credits should include Geology 401-402, 613-614, and at lease two courses (8 credits) each from Groups D and E. Students who are expecting to major in geology are strongly advised to complete, as early as possible, a year of chemistry, physics, and calculus.

Students who wish to major in Geology should consult with the Chairman, Professor Herbert Tischler.

German

The Department of German and Russian offers a major in German only. This program is designed to be of interest to the following group of students:

1. Those who have a special interest in the German language and literature and are free to pursue it.

2. Those who intend to enter professions in which a background in foreign languages and literatures is desirable. An example of such a profession is library science. Most library schools require training in two foreign languages.

3. Those who plan to teach the German language in secondary schools. Since most secondary schools require their teachers to teach more than one subject, students planning to enter teaching at this level must plan their programs carefully. They should combine a major in one of the languages and its literature with a minor or at least a meaningful sequence of courses in another subject.

4. Those who intend to go on to graduate study in the field of Germanic linguistics and literature. Such graduate study is requisite to teaching at the college level and to other specialized work in the field.

The department offers a junior year abroad at the University of Marburg. This program is open to all qualified students at the University of New Hampshire. See Description of Courses, German 685-686.

A major must comprise a minimum of 32 credits in German language and literature. German 401-402 do not fulfill part of the requirements for a major. The following courses are compulsory for German majors: German 781-782, German 757-758.

Greek

(See Spanish and Classics)

History

History, as a field in which to major, may be of interest to the following groups of students:

1. Those who wish to pursue a career as a college teacher of history. Graduate study is indispensable, but preparation may be made by a certain amount of undergraduate specialization.

2. Those who plan to teach history in secondary schools. For such a position, training in other social studies is highly desirable, if not absolutely necessary. The student is therefore advised to consult with the Department of Education, as well as with the Department of History, with a view to satisfying teaching certification standards.

3. Those who intend to enter other professional fields in which a considerable amount of historical knowledge is desirable. Such a field, for example, might be that of library training in which an historical preparation would rank with study in literature as a background, or the increasingly important profession of archivist.

4. Any students who feel free to plan the college program without too specific reference to a vocation, and who have a special interest in history.

Students majoring in history must complete 32 credits in history with grades of C or better. These courses should include a minimum of two semester courses each from Group I, Group II, and Group III (see the description of courses offered by the department); and at least four semester courses of the total should be courses numbered 600 or above. In addition every senior student majoring in history is required to complete with the grade of C or better the course, History (697), Colloquia for Senior History Majors. This course is in the nature of an undergraduate seminar, and will treat broad topics or problems of American, European, and Afro-Asian history. The specific subject of the course will change from semester to semester. History majors should come to the department to register for a particular section of this course at some time shortly before the beginning of their senior year.

Students intending to major in history should consult with the Chairman of the Department, Professor William R. Jones.

Latin

(See Spanish and Classics)

Mathematics

Career opportunities in mathematics include teaching at both secondary and college levels and scientific research and consulting work in business, industry, and government. Many positions are open to holders of the B.A. degree with a major in mathematics. Most such positions require a solid foundation in basic mathematics and provide on-the-job training in any specialties involved. On the other hand, the number of positions in mathematics that require graduate work is steadily increasing. Fortunately, the program required for admission to a graduate school in mathematics is similar to the program required by most industrial employers. The following mathematics courses are designed to meet these ends: 425-426, 527, 528, 640, 763, 767-768, and three additional mathematics courses.

While most secondary-school teachers do graduate work, most of them begin their teaching careers on the basis of the B.A. degree. Thus, the undergraduate program of the prospective secondary-school mathematics teacher should include adequate preparation for the position. Current trends in secondary mathematics curricula demand a high level of specialized training for the teacher. The following courses are designed to meet these demands: Mathematics 425-426, 640, 657, 658, 698, 763, and two additional mathematics courses; Education 481 and 657. In addition to these requirements the student in this program must complete the practice teaching block (Education 658, 659, 694; Mathematics 791) or take two additional mathematics courses.

A student who majors in mathematics must complete one or the other of these sequences.

Prospective mathematics majors are

advised to include calculus in their freshman year programs and to consult as early as possible with the Chairman of the Mathematics Department, Professor M. Evans Munroe.

Microbiology

Students interested in the study of microorganisms, including the bacteria, rickettsiae, and viruses, should register as majors in microbiology. Such students may prepare themselves for a cereer in city, state, or federal government service, or a position with universities, research institutes or industrial organizations. Opportunities are available in the areas of general microbiology, medical, public health, or veterinary microbiology, environmental microbiology, and industrial microbiology.

Students who major in microbiology are expected to complete courses offered by the department, and by related departments, to a total of 32 semester credits, with grades of C or better. A course in organic chemistry is required of microbiology majors. It is strongly recommended that students also take a year's work in mathematics and physics, and a semester of biochemistry. The courses of each major program are selected to meet the needs of the individual student, as determined by the student and his supervisor in personal conference.

Students interested in majoring in microbiology are advised to consult with the supervisor, Professor William R. Chesbro.

Music

Musical creativity occurs on many levels of participation. The theory and composition of music, performance, historical research, the teaching of musical skills to others, as well as the intelligent understanding of music by listeners, all contribute to the total art.

The Music Department offers programs of instruction in all these areas. The programs are designed to equip the student for professional careers and to provide the foundation and stimulus for graduate study. The broad scope of training in the department enables students to develop musicianship, the ability to perform, and the capacity to teach, supplemented by the full liberal arts education offered by the University.

Students pursuing a Bachelor of Arts degree in theory, composition, performance, or music history may choose from a wide variety of courses throughout the University. The Bachelor of Music candidate undergoes more specialized training in theory, composition, or performance, providing for a greater concentration of effort within the field of music. In addition, a Bachelor of Science degree program offers training for future music educators.

Academic course work is given through class instruction, while instrumental and vocal studies take place in individual, private sessions with professional musicians. Student recitals and performing organizations, such as the University of New Hampshire Symphony, Symphonic Band, Concert Choir and glee clubs, afford laboratory and concert experience in a variety of performance settings.

Students who major in music must earn grades of C or better in all required music courses. During the senior year all major students must pass a comprehensive examination which will be concerned with music history and theory. Music majors must also perform in a senior recital. For performance majors, this should be a full solo recital.

A Bachelor of Arts degree is offered with three options. (The Bachelor of Science in music education and the Bachelor of Music programs are described in separate sections). All students must complete the requirements of the basic theory courses, 471, 472 and 571, 572, and the basic history-literature course, 501, 502. In addition, the specific requirements for each option are given below.

Option I. Music History: advanced

theory (4 credits); advanced history and literature (12 credits); Music 542 and/or Music 540 (8 credits).

Option II. Performance Study: qualified students may major in voice, piano, strings, woodwind, or brass. (A student must pass a performance examination before the Department of Music staff before admission to this option); advanced theory or literature (4 credits) and performance study (16 credits — 2 credits per semester). Voice majors must take two of the following languages to graduate in this program: Italian 401; German 401; French 401. (Competence in all three languages is highly desirable.)

Option III. Theory: emphasis on musical composition; advanced theory (12 credits); advanced history (4 credits); and Music 540 (8 credits).

The Department of Music is a member of the National Association of Schools of Music. Prospective majors in music are advised to consult with the Chairman, Professor Keith Polk.

Philosophy

The Greeks understood philosophy to be the love of wisdom, that ardent desire to know which Aristotle thought was as natural to the mind as vision to the eye. Philosophy seeks to embrace and assess the significance of the many special sciences and fields of inquiry to which this generic impulse has given rise. Beyond this, philosophy seeks a comprehensive view, illumining the entirety of what is. Finally, as the quest of the true, the good, and the beautiful, philosophy aspires to be always relevant to life.

Generally speaking, 400-level courses acquaint the beginning student with the nature of philosophic inquiry and with some important philosophic concerns. A number of the 500 courses provide that foundation in the history of philosophy which is a prerequisite of all serious philosophic work. Others of the 500 courses (and 600 and 630) provide opportunity for philosophical exploration of such special fields as art, politics, religion, and psychology, usually without presupposing prior courses in philosophy. Other 600 courses and all 700 courses are for majors and others willing to acquire the necessary background.

Students who major in philosophy must earn grades of C or better in the following courses in philosophy; Philosophy 412 or 550; Philosophy 500-501; two additional 500 level courses; two 600 level courses; two 700 level courses including the senior paper. Students who plan to continue in philosophy at the graduate level should include in the above courses Philosophy 503, 504, 610, 615, 620. Attention of majors is invited to Philosophy 650 which provides instruction and practice in orderly philosophic thought and composition. Majors deficient in these respects may be required to take 650.

At least one semester prior to his graduation a student majoring in philosophy will present to the department a paper on a subject chosen in consultation with the department. Before beginning work on his senior paper, each student will have a formal conference with the department, and upon the paper's conclusion, he will defend it orally before the department.

Students interested in majoring in philosophy should consult with the supervisor, Professor Robert P. Sylvester.

Physics

Students who wish to major in physics will find a program which will prepare them for further study or for careers in teaching and research in this exciting field. The department offers a group of intermediate courses which, with parallel work in mathematics, are part of every physicists background. Laboratory work forms an important portion of each year's program and there are opportunities for students to become associated, if they wish, with one of the research programs being actively pursued by the department.

Graduates who have followed this pro-

gram can find wide opportunities in industry and government laboratories or in secondary-school teaching. If they have done well, they can continue their professional training in graduate school which will prepare them for the more responsible positions in the field. Even without more advanced work, graduates find this curriculum an admirable foundation for further study in other fields.

Students are required to complete nine courses in physics with an average grade of C or better. A student should select Physics 505-506 in the sophomore year. If Physics 401-402 is elected in the freshman year, a student may be placed in Physics 408 upon consent of the department. Since proper preparation in mathematics is essential, the student should elect Mathematics 425-426 in the freshman year, if possible, in order to have the prerequisites for the courses that follow. If Mathematics 420 has been passed with a grade of B or higher, students in the College of Liberal Arts may be admitted to Physics 407 with the specific approval of the Department of Physics. Liberal Arts students who wish to register for advanced courses in physics should discuss the mathematical prerequisites with the Department of Physics. Seniors are strongly urged to participate in the department colloquia.

The department is able to furnish the preparation necessary for teaching physics in secondary schools. As very few positions are available for teaching physics only, a student should consider a program of study which will qualify him for teaching physics and another science, such as mathematics, biology, or chemistry (see the Chemistry-Physics Program). The student interested in such a program should consult with the Chairman of the departments of Education and Physics. Students who wish, or for whom a slight possibility exists, to major in physics are advised to consult the Department Chairman early in their college program.

Political Science

The courses offered by the Department of Political Science are designed to provide a knowledge of the nature, functions, and problems of government on all levels, local to international. The department's offerings are intended to contribute to liberal education for both majors and non-majors, and to afford preparation for graduate education, professional work, and informed citizenship.

The political science major serves students who plan to undertake graduate study in political science or law, to enter public service, including the foreign service, to teach social studies, or to enter other employment and maintain an active interest in public affairs. Governments, educational institutions, professional consultants, the media, and others seek graduates of political science programs.

The major in political science consists of the following: the integrated introductory course, political science 401-402; at least 6 courses (24 credits), but no more than 8 courses (32 credits) in political science beyond 401-402 — one course (4 credits) may be from the list of cognate courses available from the student's adviser or from the departmental office; at least one course from 3 of the 5 fields established in the department (American politics, comparative politics, international relations, political thought, scope and methods of political science) as part of the above program.

In addition, majors planning graduate or professional study are expected to take at least one independent study offering, involving a research paper. Independent study listings are available to all majors, but no major may take more than two independent study courses in political science without special permission.

Students planning a major in political science are assigned to departmental advisers, who will regularly consult with them about their programs. Departmental bulletins and the departmental newsletter periodically supply information on course

offerings for the particular semester and on other matters of interest to faculty and students in the department.

Students who expect to major in political science are advised to register for political science 401-402 in their freshman or sophomore year. All courses in the major program must be passed with grades of C or higher.

Majors planning to pursue graduate work should make arrangements to take the Graduate Record Examination early in their senior year. Students who are preparing to teach government courses in secondary schools should coordinate their programs with the Department of Education. Majors interested in direct practical experience in public affairs during their undergraduate study may enroll in Social Science 681 and work as an intern in a public or private agency, with the approval of the Department Chairman and the Director of the Public Administration Service, affiliated with the Department. Departmental colloquia and other special programs involving public affairs work are sponsored from time to time.

Majors may designate the international relations option within the department with the approval of the chairman and the coordinator of the option. This program will normally require a minimum of 6, and a maximum of 8 political science courses beyond the 401-402 sequence, together with a minimum of 5 and a maximum of 10 related courses from the list of eligible courses for the option. Since this emphasis will require considerable course work outside the department, the candidate should carefully review his preparation and program with the coordinator before making application.

Psychology

A primary function of the Department of Psychology is to provide an academic major that will contribute to the liberal education of the undergraduate student. The experiences provided by the major are intended to help develop the broad viewpoint that characterizes the liberal arts graduate. By majoring in psychology, the student will develop an appreciation of the scientific study of behavior, and at the same time achieve a better understanding of the behavior of both human and infrahuman organisms.

Some students may wish to major in psychology in order to prepare themselves for later graduate study. With an advanced degree in psychology, a student may develop a career in a number of fields, among which are college teaching and research, clinical practice, counseling and guidance in secondary schools and colleges, full-time research with private or government agencies, personnel work in industry or government, psychological testing and supervision in mental hospitals, juvenile courts, public schools, or child guidance clinics. For non-majors, the study of psychology is particularly helpful for those who are preparing for careers in teaching, nursing, social work, business or industrial management, and professions such as medicine or law in which the understanding of human relations is of great importance.

Students majoring in psychology are required to complete 32 credits in a sequence of courses that meet the following criteria. Each course that is to be counted toward fulfilling major or minor requirements must be passed with a grade of C or better. Specific requirements are:

1. Psychology 401; 2. Psychology 601; 3. four courses, selected from among the following: Psychology 602, 751, 752, 758, 778, 794; 4. one additional psychology course, chosen from the following options — Psychology 789, 795, 545 *or* 575, or any course not chosen from among those listed to fulfill requirement (3) above; 5. one course chosen from offerings outside the department that is not used to fulfill College or University requirements, and is specifically approved by the student's major adviser; and 6. each psychology major must take the ETS

Undergraduate Record Examination during his senior year.

Any psychology major planning to go on to graduate work should include Psychology 602 among the courses he selects.

Students wishing to minor in psychology must register with the department during their junior year. Psychology minors must complete 20 credits in courses offered by the department that count for a major.

Students who wish to major in psychology should consult with the assistant chairman, Professor Gordon A. Haaland.

Social Service

A major in social service has as its purposes: 1. to contribute to the liberal education of students; 2. to enhance the employability of those students seeking employment in the field of social welfare immediately after graduation, and 3. to prepare students more adequately for admission to graduate schools of social work or for graduate professional education in one of the other human service professions.

Social service majors will be concerned with specialized subject matter dealing with the origin, development, and organization of health and welfare institutions. In addition, the social work profession and its relationship to social problems will be emphasized. To give the student an understanding of social welfare through observation and participation, majors are required to work in a social welfare setting for a number of weeks as part of their undergraduate study. Usually this is done the summer preceding the senior year.

For full recognition in social service, it is important for the student to complete graduate work, usually involving two years of professional study at a school of social work. There is a continuing shortage of qualified people in nearly all branches of social work. For this reason, a number of students who complete the social service major find employment each year in areas such as public welfare, child welfare services, vocational rehabilitation, etc.

Social service majors are required to take: Sociology 400, 500, 520, 621, 622, 631, 701, 702, 703, and Psychology 401 and 545. At least 32 credits of this work must be completed with grades of C or better in each course.

Interested students are advised to consult with the supervisor, Professor Pauline Soukaris, Department of Sociology.

Sociology

The major in sociology is for students who desire a liberal education with emphasis on study of the organization and differentiation of society, including study of the research methods developed in recent years for a better understanding of social phenomena; students who intend to do graduate work in sociology; or students who plan to attend a graduate school of social work but prefer a different choice of undergraduate electives than the social service major permits.

Students who wish to teach sociology in secondary schools are advised that such teachers usually have to teach related social studies. Students with this vocational aim should consult with the chairman of the Department of Education.

It is recommended that majors in sociology take Sociology 400 during their freshman or sophomore years. They must complete a minimum of 32 semester credits with grades of C or higher in sociology (or in any related course approved by the supervisor). Sociology 400, 600, 697, 701, 702, 711, 712 are required. During the second semester of the senior year majors must pass a written comprehensive examination.

The department offers an honors program to give the superior student an unusual opportunity to perform scholarly research in the field of sociology and anthropology. Sociology or social service majors may be admitted to the program

if they have a University grade point average of 3.0 or higher and a similar average in sociology courses. Honors program students will take Sociology 695, 696 in their junior year and Sociology 795, 796 in their senior year.

Students who are interested in choosing sociology as a major should consult with Professor Stuart Palmer.

Spanish and Classics

The Department of Spanish and Classics offers four majors: Greek, Latin, Classics, and Spanish. The supervisor for majors in Greek, Latin, and Classics is Professor John C. Rouman; the supervisor for majors in Spanish is Professor Charles H. Leighton.

The minimum requirements for each major are as follows:

Greek: 32 credits in Greek, including Greek 401-402.

Latin: 32 credits in Latin, excluding Latin 401-402.

Classics: 40 credits offered by the Classics Section, excluding Latin 401-402. Twenty-four of these must be in courses in Greek and Latin.

Spanish: 32 credits in Spanish, excluding Spanish 401-402.

The department also offers honors programs in classics and Spanish. Participation in these programs entails completion of the regular major requirements plus a senior research project and paper (Classics 695-696, Spanish 695-696).

Speech and Drama

The Department of Speech and Drama offers a major with three options: communications, theater, and communication disorders.

The major option in communications emphasizes a broad integrative approach to the theories and practices of verbal and non-verbal communication. Interdepartmental course work, reasonable course substitution on an individual basis, proficiency exemption, and field or laboratory work are encouraged to the end of the individual seeking and meeting his individual communications needs or goals. Communications course work can be readily related to social sciences, humanities, etc. and provides a pre-professional preparation for vocations such as law, public relations, personnel work, mass communications, cinema, etc.

The major option in theater stresses a broad background in the arts within their social framework. The student interested in the creative aspects of speech communication will find an opportunity for personal and pre-professional growth in theater and its drama, with opportunity for interdependent study of basic theories and personal involvement in active laboratory situations. Theater as a composite art, reflecting life, is closely related to painting, sculpture, music, dance, literature, and philosophy. As a public event, theater can be viewed through social science perspectives. Some of the fields of interest to graduates are children's theater and creative dramatics; public recreation, television, cinema; acting, direction and design on all levels of theater; and teaching.

The major option in communications disorders provides a study of normal speech and hearing processes contrasted with basic courses in the pathologies of communication and their treatment. It emphasizes a broad, liberal education as essential preparation for successful study of communications disorders on a graduate level. A study of human utterance involves psychology and sociology, as well as basic linguistics, anatomy, physics, etc., providing an integration of many traditional academic disciplines. The certification of the American Speech and Hearing Association requires a master's degree or its equivalent.

The required curriculum for majors in the communications option consists of:

Communications I (402); Communications II (403); Introduction to Mass Communications (555); Persuasion (506); Seminar in Criticism of Contemporary

Communications (671); one course in the area of Field or Laboratory Experience (691), including Debate Workshop (501); demonstrated basic proficiency in theater arts and speech science or appropriate course work; Senior Seminar I (697) and II (698).

Substitution of appropriate courses in other departments is possible on a basis of individual goals with approval of the major department.

The required curriculum for majors in the theater option consist of: Communications I (402); Theater and Its Drama I (435); either Theater and Its Dream II (436) or Theater and Its Drama III (438); Rehearsal and Performance I (551), Rehearsal and Performance II (552), Rehearsal and Performance III (657), Rehearsal and Performance IV (658); Scenic Arts I (459); Scenic Arts IV (652); one full course or its equivalent from Performance Project (654) and Scenic Arts Project (655) — both can be repeated; Senior Seminar I (697), Senior Seminar II (698).

The required curriculum for majors in the communications disorders option consist of: Communications I (402); Applied Phonetics of American English (524); Speech and Hearing Science (521); Speech Pathology I (631); Speech Pathology II (632); Audiology (704); Clinical Practice in Speech Pathology (634); Special Problems in Communication Disorders (602) to the extent of 4 credits (one full course); Senior Seminar I (697) and II (698).

Students interested in majoring in the Department of Speech and Drama should consult with the chairman.

Zoology

The zoology major is designed to prepare students for admission to graduate work, at least two years of which is considered minimal for undertaking professional work in pure or applied zoology. Other students may elect the major, but there will be no reduction in requirements. The University's location on tidewater and near the open ocean provides an unusual opportunity for study of marine zoology and marine ecology.

Zoology majors must earn grades of C or better in 32 credits of biology (botany, biology, zoology) courses. Minimum requirements for the zoology major are as follows: Chemistry 403-404; organic chemistry; calculus (Mathematics 425) or statistics; college physics; Botany 503; Biology 641; Zoology 412, 518, 527, 604, 729.

Students who are interested in a zoology major should consult the supervisor, Professor Philip J. Sawyer.

Bachelor of Science Curricula

The Bachelor of Science curricula permit considerable specialization in preparation for several professional activities while conserving and developing the breadth and general culture of the students enrolled in them. Curricula are offered in: art education, medical technology, and music education.

Degree Requirements

These requirements apply to students who enter the College of Liberal Arts between July 1, 1969, and June 30, 1970, and who are seeking a Bachelor of Science degree.

1. 128 semester-hour credits.

2. At least a 2.0 grade-point average in all courses completed at the University of New Hampshire.

3. The University physical education requirement.

4. English 401.

5. All the University General Education Requirements.

6. Specific Curricula Requirements: These are presented in the detailed listing of the curricula. Note that some curricula have special quality requirements.

Courses are to be completed generally in the sequence in which they are arranged.

Art Education Curriculum

This curriculum is designed to prepare teachers and supervisors of art in the public schools. It is based upon the demand for teachers who possess developed skills in the arts and a broad general culture in addition to a specialized preparation in art education. The satisfactory completion of the curriculum will satisfy the initial certification requirements for teachers of art in public schools in New Hampshire and in other states.

Freshmen who plan to enter this curriculum should elect Arts 431, Basic Design, and Arts 432, Drawing, in their first-year program.

A cumulative grade point average of 2.2, a grade point average of 2.5 in all art courses, and a grade point average of 2.5 in all education courses, including Art Education 792, are required to be eligible for Education-Art 694, Supervised Teaching.

Students seeking to transfer to the University of New Hampshire from other accredited colleges must arrange an appointment with the supervisor of the curriculum or the department chairman prior to admission to the curriculum in order that the applicant may be fully aware of the program to be followed in completing the requirements for the degree.

Interested students should consult with the supervisor, Professor George R. Thomas.

		SEMESTER	CREDITS
FRESHMAN YEAR			
P.E. 301	Physical Education		
Arts 431; 432	Basic Design and Drawing	4	4
English or elective		4	
Elective (art)			4
Social science or humanities		4	4
Science		4	4
SOPHOMORE YEAR			
Arts 401; 403	Ceramics	4	4
Arts 541	Intermediate Drawing	4	
Arts 542	Beginning Oil Painting		4
Art-Ed. 493	An Introduction to Art Education		2
Social science or humanities		4	4
Science		4	4
JUNIOR YEAR			
Arts 407	Crafts	4	
Arts 536	Graphic Arts		4
Arts 475-476	Introduction to the Arts	4	4
Educ. 481	An Educational Psychology of Development	4	
Educ. 657	Psychology of Human Learning		4
Social science or humanities		4	
S. and D. 459	Scenic Arts I		4

SENIOR YEAR			
Arts 643 or	Advanced Painting		
Arts 544	Water Media	4	
Arts 538	Graphic Design and Illustration	4	
Art-Ed. 792	Problems of Teaching Art in Elementary Schools	4	
Art-Ed. 791	Problems of Teaching Art in Secondary Schools		4
Educ. 658	Principles of Teaching		4
Educ. 659	Principles of Education		4
Ed.-Art 694	Supervised Teaching of Art		6
Social science or humanities		4	

Medical Technology Curriculum

There is now a large and increasing demand for medical technologists. Public health and medicine depend more and more upon the laboratory. Professional technicians are needed to perform various laboratory techniques and tests, such as blood typing, blood counts, tissue sections, urinalyses, and bacteriological and serological tests. Positions in this field are available in hospital laboratories, physicians' and surgeons' clinics, and in health department laboratories. Medical technologists also aid in the conduct of research in many medical centers.

Students who are interested in this field should register is the curriculum in medical technology. In this program students will take their freshman, sophomore, and junior year's work at the University and their last year's work at the Mary Hitchcock Memorial Hospital School of Medical Technology, Hanover, New Hampshire. After satisfactorily completing the courses at the School of Medical Technology (Microbiology 761-762), the student is awarded 32 credits toward the Bachelor of Science degree.

This program also qualifies the student for the examination for the medical technologist's certificate administered by the Registry of Medical Technologists of American Society of Clinical Pathologists. Thus a student can obtain the B.S. degree from the University and the M.T. certificate in a four-year period. Students who complete this curriculum are well qualified for work in any hospital or medical laboratory.

At the present time, the fees for the senior year include a University tuition fee of $50 for New Hampshire residents and $120 for non-residents and a maintenance fee of $700 (including room and board) at the Mary Hitchcock Memorial Hospital School of Medical Technology. The latter institution has a stipend program which provides $600 for students meeting the requirements of this program.

Students in the medical technology curriculum must obtain grades of C or better in 24 semester credits from the following courses: Zoology 507-508; Microbiology 503, 702, 705; Chemistry 517, 545; and Biochemistry 656.

Students who in their junior year decide not to take the training program at the Mary Hitchcock Memorial Hospital School of Medical Technology will find it possible to transfer to a major in the Bachelor of Arts program, such as microbiology or some other biological science. Is such case, they would have to satisfy requirements of the Bachelor of Arts program.

Students interested in the curriculum in medical technology are advised to consult with the supervisor, Professor Theodore G. Metcalf.

Medical Technology Curriculum

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 301	Physical Education		
Bot. 411	General Botany	4	
Zool. 412	Principles of Zoology		4
Chem. 403-404	General Chemistry	4	4
Engl. 401	Freshman English	4	
Math. 420	Fundamental Mathematics		4
	*Electives		

SOPHOMORE YEAR		SEMESTER	CREDITS
Microb. 503	General Microbiology	4	
Microb. 702	Pathogenic Microbiology		4
Chem. 517	Introductory Quantitative Analysis	4	
Chem. 545	Organic Chemistry		4
	*Electives		

JUNIOR YEAR		SEMESTER	CREDITS
Bio. Ch. 656	Physiological Chemistry and Nutrition		4
Microb. 705	Immunology and Serology	4	
Zool. 507-508	Human Anatomy and Physiology	4	4
	*Electives		

SENIOR YEAR		SEMESTER	CREDITS
Microb. 761-762	Clinical Laboratory Methods†	16	16

Music Education Curriculum

This curriculum is designed to prepare teachers of music for the public schools. It is based on the demand for teachers possessing sound musicianship and a broad general culture in addition to a specialized preparation in music education. This program is fully accredited by the State Department of Education and complies with standards set for certification of teachers and supervisors of music in most states. Training for teaching at both the elementary and secondary levels is included in the program. The Department is affiliated with the Music Educators National Conference and is a member of the National Association of Schools of Music.

To be admitted to this curriculum the student must give evidence of having a sound musical background. Freshmen must elect Music 471-472 and four credits of performance studies and music laboratories in their first-year program.

A cumulative grade-point average of 2.2, a grade-point average of 2.5 in all music courses, and a grade-point average of 2.5 in all education courses including Music Education 791 are required to be eligible for the student teaching block (see Senior Year, Semester II below).

* Student must select courses to satisfy the University general education requirements.

† This course starts about June 20 at the Mary Hitchcock Memorial Hospital School of Medical Technology and includes lecture and laboratory work in microbiology, blood bank and serology, clinical chemistry, hematology, laboratory management and ethics, mycology, parasitology, histology, and clinical microscopy. The credits are awarded in time for graduation in June of the following year after receipt of an official transcript of the grades obtained at the School of Medical Technology and certification by the director of this school and the supervisor of the curriculum that the work has been successfully completed.

Public school music teachers must maintain a satisfactory standing musically with other professional musicians in the community and should be able to play and sing acceptably. For this reason 13 semester credits in performance studies are required before graduation. Students will be encouraged to accumulate up to 8 semester credits in one instrument or voice. In addition, all candidates are required to meet minimum standards of performance in piano, voice, a woodwind instrument, a brass instrument, a string instrument, and percussion. Candidates are expected to meet the piano and voice requirements by the end of their junior year. The minimum instrumental requirements may be met by special examination, or may be demonstrated during the time the candidate is registered for performance study on these instruments. Details of minimum standards of performance may be obtained from the supervisor of the music education curriculum.

To complete degree requirements in four years, the student is allowed very little flexibility in choice of courses. The candidate might well consider spending more than eight semesters to complete the curriculum, gaining a broad general education background while preparing for the professional degree. This may be accomplished by electing the student teaching block as the ninth semester, or by spreading course work over nine semesters and placing the student teaching block in the tenth semester. The outstanding student should also consider a four-year Bachelor of Arts degree in Music, followed by a fifth year of professional work in music education leading to the Master of Arts in Teaching degree.

Students who are interested should consult with the supervisor, Professor John B. Whitlock.

FRESHMAN YEAR	SEMESTER	CREDITS
Freshman English	4	
General Education Requirement	4	8
Music 471-472 Theory I	4	4
Performance Study*	2	2
Music Laboratory	2	2
Physical Education Requirement		
	16	16

SOPHOMORE YEAR		
General Education Requirement	4	6 or 8
Music 571-572 Theory II	4	4
Music 501-502 Music History	4	4
Performance Study* I	2	1
Music Laboratory I	2	1
	16	16 or 18

* A minimum of 13 credits in performance study must be taken to fulfill curriculum requirements.
† Four techniques courses (2 credits each) fulfill minimum curriculum requirements.

JUNIOR YEAR		
Education 481	4	
General Education Requirement		8
Music 575-576 Conducting	2	2
Music 779 Orchestration	4	
Music Techniques and Methods†	4	4
Performance Study*	2	2
Music Laboratory	1	1
	17	17

SENIOR YEAR			
General Education Requirement	4	Student Teaching Block Education:	
Elective (Outside the Music Department)	4	Education 658	4
Education 657	4	Education 659	4
Music Education 787 Problems in the Teaching of School Music	2	Education-Music 694 Supervised Teaching in Music	6
Performance Study*	1	Music Education 791 The Teaching of School Music	4
Music Laboratory	1		
	16		18

Bachelor of Music Curriculum

This professional degree is offered to students who wish to major in performance or theory and who wish to develop their talent in performance and composition to a high professional standard. The majority of the courses are in music. Standards of performance are maintained which are equivalent to those offered by conservatories of music. To be admitted to this program, candidates must demonstrate a gift for performance or a significant creative ability, and in the case of performance, students must have reached a high degree of competence prior to admission. An audition or an examination is required for admission to this program.

The Bachelor of Music curriculum offers concentration in the following areas:

Option 1. Piano.

Option 2. Organ.

Option 3. Voice.

Option 4. Strings, woodwinds, brass, or percussion.

Option 5. Theory.

Requirements for the degree include: 128 semester-hour credits; a minimum 2.0 grade-point average in all courses completed at the University of New Hampshire; selected general education requirements as listed in the following options; specific curriculum requirements as follows. Courses are to be completed generally in the sequence in which they are arranged.

FRESHMAN YEAR	SEMESTER	CREDITS
All Options:		
English 401, Freshman English	4	
General Education Requirement		
Selected science	4	4
Selected social science		4
Music 471-472, Theory I	4	4
Physical Education Requirement		

Option 1. Music 542, Piano (8 credits).

Option 2. Music 544, Organ (8 credits).

Option 3. Music 541, Voice (8 credits); Music 542, Piano (2 credits); Music Laboratory — Choral, (2 credits).

Option 4. Performance Study — major instrument, (8 credits); Music 542, Piano (2 credits); Music Laboratory — instrumental, (2 credits).

Option 5. Music 542, Piano (2 credits); Performance Study — brass, (1 credit); Performance Study — woodwind, (1 credit).

SOPHOMORE YEAR	SEMESTER	CREDITS
All Options:		
General Education Requirements		
Selected social science	4	4
Selected humanities	4	4
Music 571-572, Theory II	4	4

Option 1. Music 542, Piano (8 credits).

Option 2. Music 544, Organ (8 credits).

Option 3. Music 541, Voice (8 credits); Music 542, Piano (2 credits); Music Laboratory — choral, (2 credits).

Option 4. Performance Study — major instrument, (8 credits); Music 542, Piano (2 credits); Music Laboratory — instrumental, (2 credits).

Option 5. Music 542, Piano (2 credits); Music 501-502, Music History (8 credits); Performance Study — strings, (1 credit).

JUNIOR YEAR	SEMESTER	CREDITS
All Options:		
Electives (Foreign language recommended)	4	4

Option 1. Music 542, Piano (8 credits); Music 501-502, Music History (8 credits); Music 771-772, Counterpoint (4 credits); Music 455 (455), Piano Ensemble (2 credits).

Option 2. Music 544, Organ (8 credits); Music 501-502, Music History (8 credits); Music 771-772, Counterpoint (4 credits); Music 465, Voice Class for Beginners (2 credits); Music Education 741, Techniques and Methods in Choral Music (2 credits).

Option 3. Music 541, Voice (8 credits); Music 542, Piano (2 credits); Music 501-502, Music History (8 credits); a second foreign language — German, French or Italian (8 credits); Music Laboratory — choral and/or opera workshop, (4 credits).

Option 4. Performance Study — major instrument, (8 credits); Music 501-502, Music History (8 credits); Music 575-576, Conducting (4 credits); Ensemble, (2 credits); Music Laboratory — instrumental, (2 credits).

Option 5. Music 771-772, Counterpoint (4 credits); Music 775-776, Composition (4 credits); Music 779, Orchestration (4 credits); Music 781, Form and Analysis (4 credits); Music 542, Piano (2 credits).

SENIOR YEAR

Option 1. Music 542, Piano (8 credits); Music 455 (455), Piano Ensemble (2 credits); Music 735-736, Pianoforte Literature (8 credits); two 4-credit courses elected in advanced theory and literature; two 4-credit courses elected outside the Department of Music.

Option 2. Music 544, Organ (8 credits); two 4-credit courses in liturgical music, organ literature, repertoire and hymnology; two 4-credit courses in music literature and/or advanced theory; two 4-credit courses elected outside the Department of Music.

Option 3. Music 541, Voice (8 credits); Music 542, Piano (2 credits); a third foreign language — French, German or Italian (8 credits); two 4-credit courses in music literature and/or advanced theory; Music Laboratory — choral, ensemble, and/or opera workshop, (4 credits).

Option 4. Performance Study — major instrument, (8 credits); two 4-credit courses in music literature and/or advanced theory; two 4-credit courses elected outside the Department of Music; Music Laboratory — instrumental, (2 credits); ensemble, (2 credits).

Option 5. Music 773, Canon and Fugue (2 credits); Music 777-778, Advanced Composition (8 credits); Music 542, Piano (2 credits); two 4-credit courses in music literature; two 4-credit courses elected outside the Department of Music.

All students are responsible for adding electives as needed to total a minimum of 128 credits for graduation.

College of Technology

Richard S. Davis, *Dean*
Tenho S. Kauppinen, *Assistant Dean*

Departments

Chemical Engineering
Chemistry
Civil Engineering
Electrical Engineering
Mathematics
Mechanical Engineering
Physics

Programs of Study

BACHELOR OF SCIENCE:

Engineering:
- Chemical Engineering
- Civil Engineering
- Electrical Engineering
- Mechanical Engineering

Science and Mathematics:
- Chemistry
- Mathematics
- Physics

General Information

The College of Technology offers its students a vigorous professional education in engineering, the physical sciences, or mathematics. All programs require study in the humanities and social sciences in addition to a thorough grounding in the basic aspects of mathematics, the physical sciences, and specialized studies of the chosen professional area. This pattern of undergraduate work is designed to provide a base either for a successful career in industry or for advanced study at the graduate level.

Since modern technology has drawn engineering applications and their scientific bases more closely together, the engineering curricula are oriented to emphasize the theoretical-scientific aspects of engineering. The importance of the role and responsibility of the engineer or scientist in modern society is emphasized through study in the humanistic-social areas.

Degrees

The College of Technology offers the Bachelor of Science degree in each of its departments.

For information concerning advanced degrees, see the Graduate School catalog.

Curricula

Each candidate for a degree must satisfy all general University requirements for graduation, complete at least 128 semester credits, including the courses required in one of the four-year curricula and achieve a minimum grade-point averaye of 2. Graduation credit requirements as established by departments may range from 128 to 138.

Curricula of the various departments in the College of Technology are revised and modified as required to reflect the patterns of their professional areas and to provide an effective base for the future professional growth of their graduates. Entering students may anticipate that a curricular program as presented, or as subsequently modified, will permit their graduation in four years, assuming normal loads and progress.

If a break in attendance occurs, or other than normal progress is made, the curricular requirements which must ordinarily be satisfied will be those which are in effect at the time of graduation. Specific programs accomplishing this will be prepared by the student and his adviser for approval by the Executive Commitee of the College.

The University general education requirements are a part of each curriculum. A maximum of six credits in ROTC courses may be applied to the total required for graduation in each curriculum. The ROTC courses may satisfy the third group of general education requirements which includes all courses in the University or unspecified electives outside of the general education requirements.

Honors Program

The College of Technology, through its various departments, offers the superior student the opportunity to participate in an honors program which is individually designed to provide added intellectual incentives and opportunities beyond those offered in the regular curricula. Admission to honors status is by invitation of the department concerned and with the approval of the Dean of the College. It is limited to those students entering the junior year with at least a 3.0 average.

The program permits the student, with approval of his departmental adviser and the Dean, to develop an individualized plan of study which, within the framework of his chosen professional area, may include appropriate courses from any of the colleges in the University in lieu of, and/or in addition to, those courses normally prescribed.

delete 2.

Dual Degree Programs

Students may formally combine studies in a professional curriculum in the College of Technology with studies in other curricula of the University. The College of Liberal Arts offers a broad liberal educational experience in a number of major areas or specific curricula in the Whittemore School or the College of Agriculture may be jointly pursued as the basis of preparation for an inter disciplinary career. Normally these joint programs will involve attendance for five years and two bachelor's degrees will be awarded upon satisfactory completion of the requirements of both areas.

If a student is approved for a dual degree program, initial registration will be in the College of Technology, but an adviser will be assigned from both areas so that an integrated program of study may be planned from the outset in order to accomplish the student's objectives in the most efficient and academically-sound manner.

Reserve Officer Training Corp Programs

Provision is made in each departmental curriculum for students electing to enroll in basic Air Force or Army ROTC. The basic Air Force program requires enrollment in each semester of the freshman and sophomore years. One credit per semester is earned. The basic Army program requires enrollment in Semester I of the freshman year for two credits, Semester II, zero credit, and both semesters of the sophomore year for two credits each. The student should consult his adviser for optimum course arrangements to include ROTC program requirements.

Chemical Engineering

O. T. Zimmerman, *Chairman*

Chemical engineering is that branch of engineering which involves the application of chemistry, physics, mathematics, and fundamental engineering principles to the design, construction, and operation of equipment for carrying out chemical processes on an industrial scale at the lowest possible cost. The chemical engineering curriculum, therefore, provides the student basic training in the physical sciences, engineering principles, and economics.

Although chemical engineering is a distinct profession, chemical engineers are also considered to be members of the chemical profession and a considerable portion of the chemical engineering curriculum is devoted to the science of chemistry. However, emphasis is placed upon the large-scale manufacture of chemical products instead of the laboratory phase of chemistry.

A minimum of 128 credits is required for graduation with the degree of Bachelor of Science in Chemical Engineering. There are 11 electives in the chemical engineering curriculum in addition to the mathematics elective. Six of these are for arts and humanities and social science requirements. Among the remaining five electives, at least one must be chosen from chemical engineering courses.

		SEMESTER	CREDITS
FRESHMAN YEAR			
Math. 425-426	Calculus I and II	4	4
Phys. 407-408	General Physics I and II	4	4
Chem. 405	General Chemistry	4	
English 401		4	
Electives (2)			8
		16	16
SOPHOMORE YEAR			
Chem. 683-684	Physical Chemistry I and II	2	2
Chem. 685-686	Physical Chemistry Laboratory	2	2
Math. 527	Differential Equations	4	
Phys. 505	General Physics III	4	
Ch.E. 502	Chemical Engineering Principles I		4
Math Elective			4
Electives (2)		4	4
		16	16
JUNIOR YEAR			
Chem. 547-548	Organic Chemistry	4	4
Ch.E. 601-602	Chemical Engineering Principles II and III	4	4
Ch.E. 603	Chemical Engineering Principles IV	4	
Ch.E. 604	Chemical Engineering Thermodynamics		4
Electives (2)		4	4
		16	16
SENIOR YEAR			
Ch.E. 605	Chemical Engineering Principles V	4	
Ch.E. 606	Chemical Engineering Kinetics	4	
Ch.E. 608	Chemical Engineering Design		4
Electives (5)		8	12
		16	16

Technology Curriculum in Chemistry

A. R. Amell, *Chairman*

This curriculum is intended to prepare the student for the career of a professional chemist in industry and to provide a strong foundation for graduate study leading to original and independent research.

Instruction is given by lectures, recitations, and carefully supervised laboratory work. The laboratory study is largely individual and the course work of each student is planned to furnish a broad knowledge of chemical science. The student may elect either German or Russian to enable him to read chemical literature, and he receives a grounding in mathematics and physics necessary for the advanced courses in chemistry. In the senior year, an independent research project is undertaken, permitting the student to use the reference library and chemical periodicals throughout the

course of a laboratory investigation.

A minimum of 128 credits is required for graduation with the degree of Bachelor of Science in Chemistry. The student, with the assistance of his adviser, should plan a program based on the following suggested distribution of courses.

FRESHMAN YEAR		SEMESTER	CREDITS
Approved Elective		4	
Chem. 405	General Chemistry	4	
Chem. 406	Quantitative Analysis		4
Math. 425-426	Calculus AI and AII	4	4
Phys. 407	General Physics I		4
Elective		4	4
		16	16

SOPHOMORE YEAR			
Chem. 547-548	Organic Chemisry	4	4
German or Russian 401-402		4	4
Physics 408, 505	General Physics II and III	4	4
Math. 527	Differential Equations or Approved Elective	4	
Math. 528	Multidimensional Calculus or		
Approved Elective			4
		16	16

JUNIOR YEAR			
Chem. 683-684	Physical Chemistry I and II	2	2
Chem. 685, 686	Physical Chemistry Laboratory	2	2
Chem. 697	Chemical Literature	1	
Chem. 755	Organic Chemistry	4	
Chem. 762	Instrumental Analysis		4
Chem. 775	Inorganic Chemistry		4
Electives		4	4
Elective		4	
		17	16

SENIOR YEAR			
Chem. 776	Physical Chemistry	4	
Advanced Chemistry or	other approved science course		4
Chem. 698	Seminar		1
Chem. 699	Thesis	4	4
Electives		8	8
Mathematics 401		2	
		18	17

Civil Engineering

J. Harold Zoller, *Chairman*

The profession of civil engineering, the oldest of the major branches of engineering practice, embraces the functions of planning, design, and construction of buildings, bridges, dams, transportation projects, and public works in general.

The curriculum includes a study of the basic sciences which are essential to the practice of civil engineering, and the application of these principles in the classroom, design room, and laboratory. Additional work is provided in the social-humanistic fields to produce a graduate who is technically competent and well adjusted to his social environment.

A minimum of 138 credits is required for graduation with the degree of Bachelor of Science in Civil Engineering. The student, with the assistance of his adviser, should plan a program based on the following suggested distribution of courses which averages 17 credit hours per semester.

FRESHMAN YEAR		SEMESTER	CREDITS
Chem. 403 (or 405)	General Chemistry	4	
C.E. 401-402	Engineering Statics and Computer Programming	2	2
Engl. 401	Freshman English		4
Math. 425-426	Calculus I and II	4	4
Elective (arts, humanities, or social science)		8	8
		18	18

SOPHOMORE YEAR			
C.E. 503	Dynamics	2	
C.E. 505	Surveying	4	
C.E. 506	Strength of Structural Materials		4
C.E. 508	Engineering Graphics		2
Math. 527	Differential Equations	4	
Math Elective (or Tech 601)			4
Phys. 407-408	General Physics I and II	4	4
Elective (arts, humanities or social science)		4	4
		18	18

JUNIOR YEAR			
C.E. 621	Highway Engineering I		4
C.E. 622	Engineering Materials	4	
C.E. 642	Fluid Mechanics	4	
C.E. 665	Soil Mechanics		4
C.E. 681	Structural Analysis I	4	
C.E. 682	Structural Design Concepts		4
E.E. 533	Electrical Engineering Fundamentals	2	
Elective (any department except civil engineering)		4	4
		18	16

SENIOR YEAR			
C.E. 685	Indeterminate Structures	4	
C.E. 643	Sanitary Engineering I	4	
C.E. Elective		4	8
Approved Elective		4	8
		16	16

Electrical Engineering

J. B. Murdoch, *Chairman*

Electrical engineers seek to provide solutions to real problems involving man's needs for the processing of information or for the utilization of electrical energy. By conversion of information in audible, visual, digital, thermal, or mechanical form into electrical signals we are able to transmit it over large distances, amplify it, store it, recover it rapidly, perform calculations with extreme precision and speed, or to provide automatic devices for controlling complex operations. By the generation, transmission, distribution, and efficient utilization of electrical power, we are able to provide mankind with his most versatile form of energy.

The essence of engineering is design — the art of economically applying theory and judgment to produce devices, components, and engineering systems. Most design tasks make extensive use of mathematic and basic science which are emphasized in the first two years of the electrical engineering curriculum. In the third year the student concentrates on engineering science courses. In the fourth year the emphasis is on laboratory and application courses which develop experience in the practice of measurement, analysis, and design of electrical devices and systems. In keeping with the spirit of the University's 4R program, the last two weeks of each electrical engineering course will be an independent reading or project period.

Because electrical engineering has been applied so widely to other fields of learning, medicine and business, for example, it is particularly well suited to the dual degree programs described on page 109.

The electrical engineering curriculum is intended to prepare the student for further and more specialized studies at the formal or informal graduate level and for immediate employment as an engineer-in-training.

A minimum of 131 credits is required for graduation after June, 1969, with the degree of Bachelor of Science in Electrical Engineering. The student, with the assistance of his adviser, should plan a program based on the following suggested distribution of coures.

FRESHMAN YEAR		SEMESTER	CREDITS
Math 425-426	Calculus I and II	4	4
Physics 407-408	General Physics I and II	4	4
Chemistry 405	General Chemistry	4	
E.E. 402	Introduction to Engineering Design		4
Elective*		4	4

* A student not exempted from English 401 by examination will normally take English 401 in the first semester of the freshman year.

† At least two electives in the senior year will be technical courses and at least one of these will be a 700-level electrical engineering course.

SOPHOMORE YEAR			
Math 527-528	Differential Equations and Multi Dimensional Calculus	4	4
E.E. 501-502	Linear Systems I and II	4	4
M.E. 523	Mechanics of Solids	4	
Elective		4	8
E.E. 515-516	Systems Lab I and II	1	1
JUNIOR YEAR			
E.E. 503	Electrical Circuit Theory	4	
E.E. 505-510	Electronic Materials and Circuits	4	4
E.E. 509	Electromagnetic Fields	4	
E.E. 520	Energy Conversion		4
E.E. 517-518	Electrical Lab I and II	1	4
Elective		4	4
SENIOR YEAR			
E.E. 611	Nonlinear Electronic Circuits	4	
M.E. 503	Thermodynamics		4
Elective†		12	12

Technology Curriculum in Mathematics

M. E. Munroe, *Chairman*

The technology curriculum in mathematics consists of a thorough grounding in calculus, followed by advanced work in algebra, analysis, applied mathematics, and geometry. Such a program meets the requirements currently set by graduate schools for admission to graduate study in mathematics. It also furnishes the basic mathematical training required of mathematicians in industry and government.

Modern science continues to increase its demands on the undergraduate mathematics program and the technology mathematics curriculum is subject to continual scrutiny and revision in an effort to keep up with these demands. Every effort is made to give the student of mathematics the most up-to-date possible presentation of the basic subject matter in this field.

A minimum of 128 credits is required for graduation, with the degree of Bachelor of Science in Mathematics. The student, with the assistance of his adviser, should plan a program based on the following suggested distribution of courses.

The courses and general education groups listed in the curriculum are required and what follows is a typical program. However, the order in which these requirements are met may be altered in any manner that course prerequisites will permit.

FRESHMAN YEAR		SEMESTER	CREDITS
Math. 425-426	Calculus I and II	4	4
Phys. 407-408	General Physics I and II	4	4
Lang. 401 or 501*	Foreign Language	4	
Lang. 402 or 502*	Foreign Language		4
Eng. 401	Freshman English	4	
General Education elective			4
		16	16

SOPHOMORE YEAR			
Math 527	Differential Equations	4	
Math 528	Multidimensional Calculus		4
Math 640	Linear Algebra	4	
Math 410	Computer Systems		4
General Education elective		4	4
General Education elective		4	4
		16	16

JUNIOR YEAR			
Math 767-768	Real Analysis I and II	4	4
Math 763	Abstract Algebra	4	
Approved Math Elective			4
General Education elective		4	4
General Education elective		4	4
		16	16

SENIOR YEAR			
Math 784	Topology	4	
Math 698	Senior Seminar		4
Math 788	Complex Analysis	4	
Approved Math Elective			4
General Education elective		4	4
Elective		4	4
		16	16

* The language chosen should be French, German, or Russian. If the foreign language is taken at the 500 level, it may be applied toward the arts, humanities, and social science general education requirement.

Mechanical Engineering

R. W. Corell, *Chairman*

Mechanical engineering is a challenging profession encompassing a broad spectrum of activity. It contributes to the research, design, development, and production of aerospace vehicles, underwater vessels, instrumentation and control systems, nuclear and conventional power plants, and general consumer and industrial products. The profession also makes contributions through more fundamental studies of material behavior, the mechanics of solids and fluids, and energy transformation.

The curriculum in mechanical engi-

Old catalog used 134
4-R-4R. Used 130 - to graduate

130 CREDITS

neering is designed to prepare the prospective graduate either for more advanced studies or for beginning a professional engineering career. To accomplish these objectives, the program of study provides a foundation in the basic physical sciences, mechanics of solids and fluids, thermal sciences, materials science, and design. Flexibility in the curriculum enables the student to gain additional competence in any of these areas, developing his abilities in analysis, experimentation, and engineering design. The curricula includes elective courses in the arts, the humanities, and the social sciences to provide a liberal education.

The program in mechanical engineering is further designed to develop the student's creative potential to enable him to meet the increasingly complex needs of industry, government and education, while appreciating the role of technology in a modern society.

The student, with the assistance of his adviser, should plan his program based on the following distribution of courses which average 16 credit hours per semester but totaling not less than 130 credits.

The outline which follows is to be considered as being typical only in terms of format. Within the constraints of satisfying all of the requirements, and having all necessary prerequisites, an individual student's schedule may vary from the following. Such variation will in general be caused by scheduling needs or student preference.

All elective courses will be chosen, in consultation with a departmental adviser, from courses which will lead to a balanced program in the student's chosen area of interest. The free electives are entirely the student's own choice and are without constraint.

		SEMESTER	CREDITS
FRESHMAN YEAR			
Chem. 405	General Chemistry	4	
Math. 425-426	Calculus I and II	4	4
Eng. 401*	Freshman English (or "Free" elective)	4	
Physics 407-408	General Physics I and II	4	4
M.E. 441	Engineering Graphics and Computer Programming		4
Elective	Arts and Humanities or Social Science		4
		16	16
SOPHOMORE YEAR			
Math. 528	Multidimensional Calculus	4	
Math 000	Mathematics ~~Elective~~ 527	4	4
M.E. 501-502	Linear Systems I and II	4	4
M.E. 515-516	Systems Laboratory I and II	1	1
M.E. 523-524	Mechanics I and II	4	4
Elective	Arts and Humanities or Social Science	4	4
		17	17

* A University freshman English course in reading and composition is required of all undergraduates unless specifically exempted by the English Department on the basis of a written English proficiency examination.

JUNIOR YEAR			
M.E. 503	Thermodynamics I	4	
M.E. 508	Fluid Dynamics		4
M.E. 561	Materials I	4	
Elective	Electrical Science	4	4
Elective	Technical		4
Elective	Arts and Humanities or Social Science	4	4
		16	16

SENIOR YEAR			
Free Elective		4	4
Technical Elective		4	4
Technical Elective		4	4
Technical Elective			4
Elective	Arts and Humanities or Social Science	4	
		16	16

Technology Curriculum In Physics

The technology curriculum in physics offers basic training in fundamentals, supplemented by laboratory work in the various branches of physics. Opportunity is given in the senior year for experimental investigation in some of the fields of physics under the guidance of staff members. Such a curriculum prepares its graduates for basic research in industry, the various government research organizations, or for continued academic study toward advanced degrees. The diversified opportunities in physics necessitate a flexible curriculum, enabling the student to supplement his studies in physics with other science and engineering courses.

A minimum of 12 courses in physics is required for graduation with a Bachelor of Science degree. For those students intending to pursue graduate study, it is advisable to elect physics and mathematics courses beyond the minimum requirements, and German or Russian as a foreign language. A student interested in applied physics should elect courses in electrical and mechanical engineering and chemistry. Departmental advisers should be consulted on specific programs accomplishing this purpose.

FRESHMAN YEAR		SEMESTER	CREDITS
Chem. 403 or 405	General Chemistry	4	
Eng. 401*		4	
Math 425-426	Calculus A 1 and A 2	4	4
Phys. 407-408	General Physics I and II	4	4
Elective or Chem. 404 or 406			4
Elective			4
		16	16

* A second semester of English must be elected during one of the succeeding semesters unless exempted by examination or advanced placement.

† Recommended mathematics electives to best suit the student's projeced goals in physics and Mathematics 635, 640, 753, 754, 765, 766.

SOPHOMORE YEAR			
P.E.	Basic Physical Education, if required		
Math 527-528		4	4
Phys. 505-506	General Physics III and IV	4	4
Elective		4	4
Elective		4	4
		16	16
JUNIOR YEAR			
Phys. 601	Classical Mechanics	4	
Phys. 602	Statistical Mechanics		4
Phys. 605-606	Experimental Physics I and II	4	4
Elective†		4	4
Elective		4	4
		16	16
SENIOR YEAR			
Phys. 701	Quantum Mechanics	4	
Phys. 609 or 610	Experimental Physics III or IV		4
Phys. 703-704	Electricity and Magnetism	4	4
Elective		4	4
Elective		4	4
		16	16

Whittemore School of Business and Economics

Jan E. Clee, *Dean*
Richard L. Mills, *Assistant Dean*

Curricula

Administration
Economics
Hotel Administration

Programs of study

BACHELOR OF ARTS:
Economics

BACHELOR OF SCIENCE:
Administration
Hotel Administration

General Information

The Whittemore School of Business and Economics was established as a separate degree-granting school July 1, 1962.

The basic purpose of the School in its undergraduate curricula is to provide a broad academic background, with professional training in one of the disciplines of administration, economics, or hotel administration. Undergraduate students are required to take a substantial part of their course work in other colleges of the University.

Although upon graduation a student will have a certain degree of professional competence in the area in which he chooses to concentrate, he will shortly discover that from the point of view of his future development substantial familiarity with a selection of other academic disciplines is desirable. In particular, students will be encouraged to elect courses in the social sciences, mathematics, the natural sciences, the arts, and the humanities. The student who pursues study in the relatively broad curricula of administration or economics will also find that he is prepared for advanced study at the graduate level in these and related disciplines.

Requirements for Degrees

The Whittemore School offers the degrees of Bachelor of Arts and Bachelor of Science. Students concentrating in economics will be candidates for the Bachelor of Arts degree, and students concentrating in the other curricula will be candidates for the degree of Bachelor of Science. Each candidate for a degree must satisfy the general education requirements and all other University requirements for graduation, earn at least 128 semester credits, including the courses required in one of the four-year curricula described below, achieve a minimum grade-point average of 2.0, and achieve a minimum grade-point average in his curriculum as prescribed for that program.

The several curricula in the Whittemore School are subject to revision and modification from year to year. Students are subject to and responsible for such changes as they may be introduced. Entering students may anticipate, however, that a curriculum as presented, or as subsequently modified, will permit their graduation in four years, assuming that normal academic loads are carried and normal progress is made.

An undergraduate student entering the school will be required to declare his major not later than the end of his sophomore year. The new catalog becomes effective on July 1 of each year. For information concerning advanced degrees, see the Graduate School catalog.

Independent Study

A junior or senior student in the Whittemore School of Business and Economics may elect to take advantage of the opportunity for independent study. The credits allowed range from 6 semester hours for juniors up to 12 semester hours for seniors. To be eligible the student must have a cumulative academic average of 3.0 or better and submit at least 60 days in advance of registration a plan for his independent study that has the approval of his adviser, the instructor involved, and the School Executive Committee. The student pursuing an independent-study program must meet all general School requirements. He may petition to submit independent-study credits in whole or in part for required-course credits in the economics curriculum or for elective credits in either of the prescribed curricula.

A student with a superior academic record who pursues an independent-study program for a significant portion of a semester's work may petition to be designated "Whittemore Scholar".

The student taking an independent study program will be assigned a mem-

ber of the faculty of his major area of concentration as his adviser. It is expected that his program will normally take the form of an independent research paper, although programs calling for another form will be considered. The result of a student's activity under this plan will be judged by three members of the faculty selected by his adviser and the Dean.

Minor Program

A minor is not required in the economics, administration, and hotel administration curricula. A student in any one of these curricula may, however, apply for permission to pursue a minor program of study in any discipline in which sufficient courses are offered at the University. Permission to participate in a minor program may be granted only by the Executive Committee of the School with the concurrence of the particular department involved. Consideration shall be given to the student's major area of concentration and proposed minor before granting such permission. Successful completion of such a program is recorded on a student's academic transcript.

A minor shall comprise at least 16 semester hours in the minor department with grades of C or better in courses which count for major credit. No more than 8 credits used to satisfy area of concentration requirements shall be used for a minor.

Dual Degree Program

A student may obtain more than one undergraduate degree by completing all the curriculum, departmental, college, scholastic, and other requirements. Anyone interested in such a program of study should confer with the deans of the colleges in which he intends to earn degrees as early in his academic career as possible and, if approved for the program should expect to work closely with faculty advisers from the colleges involved.

Administration Program

The purpose of the administration program is to provide the student with the basic managerial capabilities requisite to a society characterized by rapid change. The administration program has been designed as an integrated program for upperclassmen. The first year of the program presents the core material and the second year offers several options for concentration. The intent of the administration program is to provide the student with a good foundation in liberal arts and sciences followed by a broad professional education in basic principles, concepts, and analytical tools for a career in management. To emphasize the importance of a good foundation in the liberal arts and sciences in the development of managerial capabilities, the program permits the student to elect one course outside the area of administration in each semester of the two-year professional program.

Enrollment in the Whittemore School program in administration shall be made upon application to the Dean. Applicants must normally have completed two full years of study in the University and be in good standing. Applicants normally should have completed college work in mathematics and economics.*

The required courses in the administration program will build upon those that precede and the regular cycle of the program will begin each September. Students must plan to maintain the prescribed course schedule. Applications for enrollment in the administration program should be submitted at least two weeks prior to pre-registration during the second semester of the student's sophomore year.

Individual students not enrolled in the program may take specific courses in the program, but permission of the instructor will be necessary and junior year standing will normally be required.

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* For example, Mathematics 415 and Economics 401, 402 are sufficient.

To qualify for graduation, students admitted to the administration program must obtain a cumulative academic average of C or better in the courses required by this program and the student must have earned a B or better in at least three of these required courses.

The program for the junior year is as follows:

JUNIOR YEAR

		SEMESTER COURSES	
		FIRST	SECOND
Admin. 605-606	Quantitative Analysis I & II	Full	Full
Admin. 611-612	Organizational Behavior	Half	Half
Admin. 601-602	Values in a Managerial Society	Half	Half
Admin. 617	Financial Reporting, Accounting, and Control	Full	
Admin. 614	Organizational Theory		Full
	Electives	Full	Full

SENIOR YEAR

The first semester will require one of several three-course options (i.e., business administration, institutional administration, etc.).

The second semester will require a terminal integrating course and a seminar associated with the option chosen in the first semester.

Economics

Students concentrating in economics will be expected to fulfill the basic requirements set down for general liberal arts students, such as the modern language and science requirements. In addition, within their area of concentration they will be able to take, among others, such advanced courses as national income analysis, intermediate economic theory, money and banking, international economics, statistics, and comparative economic systems.

It should be borne in mind, however, that undergraduate training in economics by no means qualifies a student as a professional economist. Those students who intend to become professional economists should plan on taking a minimum of three years of graduate work in the discipline after they have obtained their bachelor's degree. Nevertheless, undergraduate training in economics does provide an excellent background for graduate training not only in that discipline but in other related disciplines, such as government and law. If a student plans to receive only the bachelor's degree, he will find that his work in economics will qualify him for many positions in business and government service.

Students planning to pursue graduate study in economics should consult with their advisers early in their academic program. This consultation should facilitate entrance into graduate programs.

Students in this curriculum are required to complete seven full courses in economics with a cumulative academic average of 2.0 or better. Major credit toward required courses will be approved in the case of transfer students only if such courses have been taken as upper division courses, i.e., in the junior or senior year. In addition, at least five of the required economics courses shall be earned at the University of New Hampshire.

Proficiency in a foreign language at the level achieved by satisfactory work in a one-year college level course is required of economics majors. This requirement may be fulfilled by achieving a satisfactory score on College Board tests or by completing one of the 401-402 series in any foreign language sequence at the University of New Hampshire. Students having studied a foreign language for two or three years in high

school should be able to achieve a satisfactory score on the College Board tests. Placement in advanced courses in foreign languages by College Board tests or by any other approved procedure, including transfer, satisfies this language requirement.

		SEMESTER COURSES	
		FIRST	SECOND
FRESHMAN YEAR			
P.E. 301	Physical Education	——	——
Eng. 401	Freshman English	Full	
	GER Electives	3 Full	3 Full
	Elective		Full
SOPHOMORE YEAR			
P.E. 301	Physical Education	——	——
Math. 415	Mathematics for Business & Economics (GER)	Full	
Econ. 401, 402	Principles of Economics	Full	Full
	GER Electives	2 Full	2 Full
	Elective		Full
JUNIOR YEAR			
Econ. 605	Intermediate Economic Analysis		Full
Econ. 611	National Income Analysis	Full	
Econ. 525	Introduction to Economic Statistics	Full	
	GER Electives	2 Full	2 Full
	Elective		Full
SENIOR YEAR			
	Economics Elective	Full	Full
	Electives	3 Full	3 Full

Hotel Administration

Students pursuing the hotel administration program will experience a broad general education. Approximately two thirds of the courses explore the cultures so necessary for an appreciation of the social and technical aspects of life. This foundation is supplemented by basic administration and economics courses integrated with courses related specifically to the lodging and feeding segments of the rapidly expanding services sector of the world-wide economy.

This Bachelor of Science program is intended primarily for those who wish to become managers and executives of medium-sized operations, not immediately upon graduation but after gaining sufficient experience and acquiring those techniques of decision making that can come only with maturity and exposure. To insure that students are knowledgeable of the interdependence of the basic skills required and the organizational behavior in the customers presence, two summers or the equivalent of approved on-the-job experience must be completed.

Students in the hotel administration program must obtain a cumulative academic average of 2.0 or better in the required courses given in the Whittemore School. A graduate of this program, who is qualified for and interested in further allied studies, is well prepared to enter an advanced degree program in business or institutional administration.

		SEMESTER COURSES	
FRESHMAN YEAR		FIRST	SECOND
P.E. 301	Physical Education	——	——
Engl. 401	Freshman English	Full	
H.A. 403	Elements of Institutional Administration	Full	
Math. 415	Mathematics for Business & Economics (GER)	Full	
Biol. 401-402	Biology (GER)	Full	Full
H.A. 410	Workshop for Public Services Management		——
	GER Electives:		
	Social Sciences or Arts & Humanities		2 Full
	Non-Major		Full
SOPHOMORE YEAR			
P.E. 301	Physical Education (Women)	——	——
H.A. 509	Financial Analysis & Controls	Full	
Econ. 401-402	Principles of Economics (GER)	Full	Full
Admin. 517	Financial Accounting	Full	
	GER Electives:		
	Physical Science or Math		Full
	Social Sciences or Arts & Humanities	Full	Full
	Non-Major		Full
H.A. 412	Workshop for Public Services Management		——
JUNIOR YEAR			
H.A. 655	Management for Transient, Leisure, & Indigent Services	Full	
Econ. 525	Introduction to Economic Statistics	Full	
Admin. 519	Managerial Control	Full	
Admin. 653	Financial Management		Full
H.A. 656	Management of Physical Structures		Full
H.A. 614	Workshop for Public Services Management		——
	GER Elective (Non-Major)	Full	2 Full
SENIOR YEAR			
H.A. 667	Functional Management	Full	
	GER Elective (Non-Major)	Full	
H.A. 666	Markets & Promotion of Public Services		Full
H.A. 616	Workshop for Public Services Management (for completed series)		Half
	Electives	2 Full	2 Full & Half

Division of Health Studies

General Information

The Division of Health Studies was established by the University of New Hampshire in 1969. In its undergraduate curricula, the basic purpose of the Division is to provide a liberal and professional education in health-related disciplines. Currently the following professional curricula leading to the Bachelor of Science degree are offered: nursing, occupational therapy, physical education for men, physical education for women, and recreation and parks. In these programs the undergraduate student is required to take a substantial portion of his course work in the College of Liberal Arts and other colleges of the University.

The University requirement in physical education, applicable to all undergraduate students, is administered by the Departments of Physical Education within the Division.

Degree Requirements

Each candidate for a degree must satisfy all general University requirements for graduation as listed on page 65, earn at least 128 credits, including the courses required in one of the curricula described below, achieve a minmum cumulative grade-point average of 2.2, and achieve a minimum grade-point average in his curriculum as prescribed. Generally, courses are to be completed in the sequence in which they are arranged.

The several curricula in the Division of Health Studies are subject to modification and revision from year to year.

An undergraduate student may select his major upon entering the Division or declare a major in the Division not later than the end of his sophomore year.

Minor Option

A minor may be earned in other undergraduate disciplines in the University contingent upon approval of both the major and minor departments. A minor consists of 18 credits with C or better, in courses which the adviser in the minor discipline approves. No more than 6 credits used by the student to satisfy curriculum requirements in his major may be used for his minor. He should declare his intent to earn a minor as early as possible and no later than the end of his junior year.

Nursing

The Department of Nursing accepts and functions within the philosophy of the University of New Hampshire. The need for more and better nursing care for all people and for more well-qualified nurses to give such care is both urgent and immediate. More nurses must be educated in colleges and universities if we are to meet our nation's nursing needs. The student interested in nursing as a career is encouraged to consider majoring in nursing. Graduates of the bacca-

laureate program in nursing receive preparation in general professional education with an emphasis on the social, physical, biological, and nursing sciences. They receive a Bachelor of Science degree and are eligible to take State Board examinations to become a registered nurse.

Nursing is a professional process which recognizes the individuality of man. It is committed to caring for the whole person in a variety of settings, aiding him in illness or in promotion or maintenance of health. The nursing curriculum progresses from the simple to the complex; from understanding of self as an individual, to understanding as a member of a family in a community, and ultimately to understanding as a member of a changing society.

The nursing faculty of the University is responsible for the nursing courses. Learning experiences (nursing laboratories) are arranged in hospitals in the area, a medical center, and community health and other health agencies. During one semester of the junior or senior year it is necessary for the student to live off campus.

Additional expenses for the nursing student include in the sophomore year, uniforms costing approximately $40 and transportation costs of about $30. During the junior and senior year nursing students are responsible for their own transportation to nursing laboratories.

Students in the nursing program should obtain a grade-point average of 2.0 or better for the accumulative average of the nursing courses by the end of the first semester of the junior year. It is expected that the total accumulative average of nursing courses will be 2.2 or better by the senior year. This curriculum requires 128 credits for graduation.

Special scholarships and loans are available for the students.

Students interested in the program are encouraged to talk with the Chairman of the Department of Nursing.

		SEMESTER	CREDITS
FRESHMAN YEAR			
Eng. 401	Freshman English	4	
Chem. 403-404	General Chemistry	4	4
Nurs. 401-402	Introduction to Nursing	0	0
Soc. 401	Introductory Sociology		4
Humanities		4	
Elective		4	4
Elective			4
SOPHOMORE YEAR			
Zool. 507-508	Mammalian Anatomy and Systemic Physiology	4	4
Nurs. 503-504	Fundamentals of Nursing	4	4
Psych. 401	General Psychology	4	
H.E. 573	Nutrition		4
Elective		4	4
JUNIOR YEAR			
Nurs. 551	Medical and Surgical Nursing	4	
Microb. 503	General Microbiology	4	
H.E. 425 or Psych. 537	Child Development / Developmental Psychology	4	
Elective		4	
Nurs. 602, 621	Comprehensive Nursing		16

SENIOR YEAR		
Nurs. 602, 621	Comprehensive Nursing	16
Nurs. 702	Senior Seminar in Nursing	8
Elective(s)		8

Occupational Therapy

Occupational therapy uses purposeful activity as treatment in the rehabilitation of people with emotional or physical disabilities. The media employed in treatment by the occupational therapist include manual and creative arts, activities of daily living, work, and avocational skills. The occupational therapist works as a member of the rehabilitation team in consultation with physician, nurse, physical therapist, psychologist, social worker, vocational councellor, and others. Community agencies, special schools for handicapped and retarded children, outpatient centers, as well as hospitals and rehabilitation centers, offer positions working with patients of all ages. As well as working as a clinician, the registered therapist will find challenging opportunities in consultation, administration, teaching, and research.

The occupational therapy curriculum was fully accredited in 1964 by the Council on Education of the American Medical Association and the American Occupational Therapy Association. It is designed to meet the requirements of these accrediting bodies, and to provide a four-year course leading to the Bachelor of Science degree. The program includes theoretical studies in biological and medical sciences, in psycho-social science, in the evaluation of patient and activity, in the planning and administration of treatment, as well as the development of practical skills in a wide range of theraputic media, evaluative, and treatment procedures. Pre-clinical observation and guided practice of patient treatment in local clinical situations are incorporated in the course requirements and reading periods.

Both men and women with physical vitality and emotional stability, who are interested in working with people, enjoy using their hands, show proficiency in both biological and psychological sciences, may be admitted to the program. Each student entering the program should take the OT aptitude tests. Once on campus the department will schedule test times for each student.

High school students considering this major should take 3 units of a laboratory science including biology for entrance into this program in the freshman year. Students who do not enter as freshman in this program may declare OT as a major at the end of the freshman year following an interview with the department committee.

Students seeking to transfer into the program from other accredited colleges must do so through the Admissions office. It is possible to enter the program in either the sophomore or junior year depending on the courses and credits accepted for transfer. Consultation with the department chairman prior to admission to the curriculum is required in order that the applicant may be fully aware of any problems or delays involved in completing the requirements for the degree.

Graduation requirements include a 2.2 cummulative average, a grade of C or better in Zoology 508; Pathology; Physical Education for Men 652; Neurology; Child Development; Occupational Therapy 411, 524, 584, 526, and Occupational Therapy 627; and pre-clinical experience in three reading periods.

Following completion of the four-year degree program the student will spend a minimum of nine months in student affiliations in American Hospital Association hospitals or in service under the direction of a registered occupational therapist. These are selected from centers

approved for this curriculum and divided as follows: Occupational Therapy 711, General Medicine, Surgery, and Pediatrics — three months; 712, Psychiatry — three months; 713, Physical Disabilities and Rehabilitation — three months.

When affiliation positions are available students will be expected to take the first affiliation in the summer between junior and senior years. After receiving his B.S. the student is expected to complete the affiliation assignments as scheduled. Due to a scarcity of affiliation opportunities the University can accept responsibility for scheduling affiliations only once for each student. A student affiliation fee of $95 for residents of New England and $200 for non-residents is payable in advance to the University by those students who enter the clinical affiliation program.

Students should be prepared to provide uniforms as required and to meet all of their living and travelling expenses during the affiliation period. The University cannot guarantee maintenance though it may be available at times. The American Medical Association requires a physical examination including a tuberculin test prior to hospital affiliation.

On completion of the nine-month affiliation period and with approval of the curriculum director, the student is entitled to a certificate of occupational therapy. This certificate and certification of the curriculum director qualify the student to take the examination for registry in the American Occupational Therapy Association. The standard examination is sent out by the association and administered by the University. A fee of $30 is charged by the association for each examination. The present demand for qualified therapists is far in excess of the supply. There are only limited opportunities for those who have not become registered by the American Occupational Therapy Association.

Students interested in the opportunities offered by this program are encouraged to consult the chairman of the department and to register for Occupational Therapy 400, An Exploration of Occupational Therapy.

		SEMESTER	CREDITS
FRESHMAN YEAR			
Eng. 401	Freshman English	4	
Psych. 401	Introductory Psychology	4	
Psych. 537	Child Development		4
O.T. 400	Occupational Therapy—Exploration	0	
Electives (GER)		8	12
SOPHOMORE YEAR			
Soc. 500*	Social Problems	4	
Zoo. 507-508†	Anatomy and Physiology	4	4
O.T. 411	Occupational Therapy Theory I	4	
Arts 419	Weaving	2	
O.T. 422	Needlecraft	2	
Arts 425	Woodworking		4
	Pathology		2
Psych. 545	Clinical Methods		4
P.E.M. 652	Kinesiology		4
	Pre-Clinical‡		

* This course or its equivalent is required by the American Medical Association.

† Students with a strong biology background may elect this course in the freshman year.

‡ Reading period project of one- or two-week duration. Facility arranged with student.

|| Course extends over two semesters — grade being assigned at the end of the second semester.

JUNIOR YEAR			
O.T. 515	Treatment Media I — Crafts	4	
O.T. 583	Medical Lectures I — Psychiatry	2	
	Sensitivity Training Group	2	
	Neurology	4	
Elective (GER)		4	
O.T. 524	Occupational Therapy Theory II — Psycho-Social		4
O.T. 526	Occupational Therapy Theory III		4
O.T. 584	Medical Lectures II — Physical Dysfunction		6
O.T. 520	Treatment Media II		4
	Pre-Clinical‡		
JUNE 1–AUGUST 30			
O.T. 711 or 712	First Affiliation	0	0
SENIOR YEAR			
O.T. 627	Occpational Therapy Theory IV — Advanced Physical Dysfunction	4	
O.T. 650 ||	Senior Seminar	2	2
Electives (GER)		8	12
CLINICAL AFFILIATIONS			
O.T. 711 or 712	General Medicine, Surgery, and Pediatrics	0	0
	Psychiatry	0	0
O.T. 713	Physical Disabilities and Rehabilitation	0	0

American Occupational Therapy Association Registration Examination — Last Friday of June.

Physical Education for Men

The Physical Education curriculum is offered for students who are interested in preparing themselves for positions in the fields of health and physical education and as coaches of athletic teams. Freshmen who are interested in this curriculum should register for Physical Education 441-442 in lieu of Physical Education 301 and should elect Physical Education 453. Students also may elect and are encouraged to choose courses to broaden their educational scope. Those planning to enter graduate work in this field should elect additional foundation science courses and a foreign language. A cumulative grade point average of 2.2, a grade point average of 2.5 in all physical education courses, and a 2.5 average in all Department of Education courses, and including Physical Education 665 and Physical Education-Education 792 are required to be eligible for Education 794, Directed Teaching of Physical Education.

		SEMESTER	CREDITS
FRESHMAN YEAR			
P.E. 441, 442	Physical Education	1	1
Chem. 401-402	General Chemistry	4	4
Soc. 400	Introductory Sociology	4	
Psych. 401	General Psychology		4
P.E. 453	Principles of Physical Education	4	
	Electives	4	8
SOPHOMORE YEAR			
P.E. 443, 444, 445	Physical Education	1	2
Zool. 507-508	Mammalian Anatomy and Systemic Physiology	4	4
Educ. 481	An Educational Psychology of Development	4	
P.E. 582	Personal and Community Health	4	
P.E. 510	Medical Aspects of Sports and Physical Education		4
P.E. 522; 523; 524; 529, 530	(Select one)		2
	Electives	4	4
JUNIOR YEAR			
P.E. 446, 447, 448	Physical Education	2	1
Educ. 757	Psychology of Human Learning	4	
P.E. 620	Physiology of Exercise	4	
P.E. 521; 525; 526; 527; 528	(Select one)	2	
P.E. 522; 523; 524; 529; 530	(Select one)		2
P.E. 652	Kinesiology		4
P.E. 668	Measurement Procedures in Physical Education		4
	Electives	4	4
SENIOR YEAR			
P.E. 449, 450	Physical Education	2	
P.E. 775	Perceptual Motor Learning	4	
P.E. 521; 525; 526; 527; 528	(Select one)	2	
Educ. 759	Principles of Education		4
Educ. 794*	Directed Teaching of Physical Education		6
P.E. 665	Administration of Physical Education in Secondary Schools		4
P.E. 792	Problems of Teaching Physical Education in the Elementary School		4
	Elective	4	

* Student teachers may register for practice teaching block in either Semester I or Semester II of the senior year.

Physical Education for Women

For women students who plan to prepare themselves for positions as teachers of physical education, the University offers the Physical Education Curriculum for Women. The program is based on the demand for teachers possessing specialized professional background, broad general education, and the qualities of leadership necessary to effective teaching and the development of sound physical education programs. Furthermore, students have the opportunity, if they so desire, to prepare themselves to teach in a subject-matter field as well as in physical education. The curriculum is open to women who have satisfactorily completed the freshman year and are approved by the Department of Physical Education for Women for admission to that field of concentration. It provides an opportunity for students to teach physical education under supervision in nearby schools.

A cumulative grade-point average of 2.2, a grade-point average of 2.5 in all physical education courses, and a 2.5 average in all Department of Education courses, and including Physical Education 656, are required to be eligible for Physical Education — Education 792 and Education — Physical Education 794, Directed Teaching of Physical Education, in the student teaching block program.

Under Physical Education 411, 412, 421, 422 (freshmen); 413, 414, 423, 424 (sophomore); and 415, 416, 425, 426 (juniors), physical education curriculum students take sections especially reserved for them. During the four years the student should show proficiency in the following: movement fundamentals, soccer, lacrosse, swimming, basketball, volleyball, tennis (intermediate), field hockey, stunts and tumbling, gymnastics, elementary games, folk and square dance, modern dance, badminton, golf, and track and field.

For those who are highly skilled in the activities mentioned above, substitutions are made with the approval of the adviser. Students will be encouraged to elect activities unfamiliar to them and to gain greater proficiency in previously experienced activities. Further dance and other activities not listed above are included in courses in the curriculum.

A student wishing to achieve certification for teaching in most states should follow the prescribed curriculum. Course substitutions may be made in consultation with the adviser for students who do not desire certification for teaching and who plan to pursue graduate study.

For students in this curriculum, the following courses offered by other departments are suggested as valuable electives: Arts 408, Microbiology 501, Speech 403, Humanities 501-502, Music 403, 404, Psychology 537, Sociology 400, Sociology 560. Physical Education 454 is also recommended. Students are advised to choose non-professional electives whenever possible. Those planning to enter graduate study should elect a foreign language.

Any student in this curriculum who is planning to teach in areas in addition to physical education must complete, with an average grade of C or better, a second teaching major of 18 semester credits in subjects taught in high schools.

Students interested in majoring in physical education should consult one of the supervisors, Professor Janet Atwood or Professor Marion C. Beckwith.

FRESHMAN YEAR		SEMESTER	CREDITS
P.E. 411, 421, 422	Physical Education	1, 1	1, 1
Engl. 401	Freshman English	4	
Biol. 401-402	Man and the Living World	4	4
Psych. 401	General Psychology		4
P.E. 453	Principles of Physical Education	4	
Electives*		4	8

For the sophomore, junior, and senior years students wishing to obtain certification to teach physical education should complete the following requirements:

ADDITIONAL UNIVERSITY REQUIREMENTS		CREDITS
Electives*	Nine courses	36
CORE OF PHYSICAL EDUCATION MAJOR		
P.E. 620	Physiology of Exercise	4
P.E. 652	Kinesiology (Prerequisite: Zoology 507-508)	4
P.E. 775	Perceptual Motor Learning	4
TEACHER PREPARATION COURSES		
P.E. 413, 414, 423, 424, 415, 416, 425, 426, 417	Physical Education Activity	9
P.E. 554	The Teaching of Dance	4
P.E. 563, 564	The Teaching of Sports	4, 2-4
P.E. 625	Dynamics of Human Movement	2
P.E. 655	Remedial Gymnastics	4
P.E. 668	Measurement Procedures in Physical Education	4
EDUCATION COURSES		
Ed. 481	An Educational Psychology of Development	4
Ed. 657	Principles of Human Learning	4
Ed. 659	Principles of Education	4
STUDENT TEACHING BLOC		
P.E. 665	Administration of Physical Education in the Secondary School	4
P.E.-Ed. 792	Problems of Teaching Physical Education in the Elementary School	4
Ed-P.E. 794	Directed Teaching of Physical Education	6

The following additional courses may be elected by students in physical education and related fields.

P.E. 431	Rhythmic Analysis	2
P.E. 432	Labanotation	2
P.E. 433, 434	Dance Composition	2–2
P.E. 454	Organized Camping	4
P.E. 455	Introduction to Community Recreation	4
P.E. 460	Recreation Leadership	4
P.E. 561	Nature Recreation	4
P.E. 656†	Problems of Health Education	2

* These electives must be used to complete the University general education requirements, see page 65.
† May be required for certification to teach in some states.

Recreation and Parks

The need for professionally trained recreation and/or park leaders and administrators far outreaches the supply. The men and women graduates in this program will receive a Bachelor of Science degree after successfully completing the following listed requirements. Prior to registering for Physical Education 788, the student must have a cumulative grade-point average of 2.2. Permission to enter this curriculum must be obtained from the adviser for recreation and parks.

In addition to the curriculum requirements, the student is encouraged to seek summer or part-time employment with a recreation agency. Camp and playground work are specifically recommended. For further information, contact Professor Evelyn Browne or Professor Robert E. Wear.

		SEMESTER	CREDITS
FRESHMAN YEAR			
P.E. 411, 412	Physical Education (Women	1	1
P.E. 441, 442	Physical Education (Men)	1	1
Biol. 401, 402	Man and the Living World	4	4
Engl. 401	Freshman English	4	
Hist. 501, 502	Introduction to Contemporary Civilization	4	4
P.E. 455	Introduction to Community Recreation	4	
P.E. 454	Organized Camping		4
Electives			4
SOPHOMORE YEAR			
P.E. 413, 414	Physical Education (Women)	1	1
P.E. 443, 444	Physical Education (Men)	1	1
Econ. 401	Principles of Economics	4	
P.E. 460	Recreation Leadership		4
Psych. 401	Introduction to Psychology	4	
Zool. 507-508	Human Anatomy and Physiology	4	4
Electives		4	8
JUNIOR YEAR			
Administration 517	Financial Accounting	4	
Speech and Drama 403	Communications II	4	
Speech and Drama 458	Scenic Arts I		4
Pol. Sci. 401	Elements of Political Science	4	
Soc. 400	Introductory Sociology		4
P.E. 561	Nature Recreation		4
P.E. 541	Recreation Practicum		2
Electives		4	4
SENIOR YEAR			
P.E. 663	Recreation and Park Administration	4	
P.E. 677	Areas and Facilities Design for Recreation	4	
P.E. 541	Recreation Practicum	1	1
P.E. 788	Recreation Field Work		6
P.E. 798	Recreation Research Seminar		2
P.E. 644	Outdoor Education		4
Soc. (500)	Social Psychology	4	
Electives		4	4

The Graduate School

Master of Science
Animal Sciences
Biochemistry
Biology
Botany
Chemical Engineering
Chemistry
Civil Engineering
Electrical Engineering
Entomology
Forest Resources
Genetics
Geology
Home Economics
Mathematics
Mechanical Engineering
Microbiology
Music Education
Physics
Plant Science
Resource Economics
Soil and Water Science
Zoology

Master of Arts
Economics
English
French
German
History
Music
Political Science
Psychology
Sociology
Spanish

Master of Arts in Teaching
Department of Education

Master of Science for Teachers
Chemistry
English
French
German
Mathematics
Physics
Spanish

Master of Agricultural Education
Department of Agricultural Education

Master of Business Administration
Whittemore School of Business and Economics

Master of Education
Department of Education

Master of Public Administration
Department of Political Science

Doctor of Philosophy
Biochemistry
Botany
Chemistry
Genetics
Mathematics
Microbiology
Physics
Plant Science
Psychology
Sociology
Zoology

Graduate School

The Graduate School, which has offered instruction since 1903, has for its objective the bringing together of faculty and qualified students in a spirit of scholarship and research. The graduate student is given opportunity to specialize in some field of knowledge, and to develop a maturity of thought and attitude toward his professional field, so that both his professional and his cultural life are enhanced. The work of the Graduate School is under the general direction of the Graduate Faculty. The Dean of the Graduate School is responsible for the administration of the regulations and requirements pertaining to admission, conduct of work, the granting of advanced degrees and other pertinent matters.

Assistantships, Scholarships, and Fellowships

Graduate teaching or research assistantships are available in most departments. These involve part-time work in research and teaching activities or some combination thereof. The University also sponsors tuition scholarships, a UNH Fellowship program available to Ph.D. candidates, the Alumni Fellowship program available to graduate students in the social sciences and the humanities, Martin Luther King scholarships to assist members of minority groups, and one-year Dissertation Fellowships. There are also a number of fellowship programs sponsored by outside agencies such as National Aeronautics and Space Administration, National Science Foundation, U. S. Office of Education and the U. S. Public Health Service.

Further Information

Detailed information about admission, requirements for degrees, courses, fellowships, scholarships, and assistantships are to be found in the Graduate School catalog which may be obtained by writing to the Dean of the Graduate School.

Interdisciplinary Programs

Inter-College Courses

Three courses in this category were offered on a University-wide level for the first time in the second semester of 1968-69.

Inter-College 500, Contemporary Institutions and Their Values, is a critical examination of the values and disvalues of important contemporary American institutions which exert great influence on American society. Each offering of the course considers one of these institutions which is in the focus of public attention. For example, in Semester II of 1968-69 the course was devoted to a consideration of the development and the present state of the American university. Other possible subjects are business and non-profit corporations, the scientific community, the military, etc. The course is limited to 50 students who must have at least sophomore standing or permission of the instructors. 4 credits.

Inter-College 596, Contemporary Issues, deals with selected topics from three broad issue-oriented areas: racial problems, poverty, and political process. Broad supervision of this course is provided by the Commission on Contemporary Issues. Because these areas cover a wide range, the course is divided into three autonomous sections and the student is assigned to the section dealing with the issue he selects for study. The

general format is to involve students at two levels of learning: (1) observation, study, and reflection of social problems through reading, discussion, and writing; and (2) experience and participation in the field. Each section is limited to 25 students. 4 credits.

Inter-College 598, Independent Work-Study, has been organized by the Commission on Contemporary Issues. It allows the student to select the problem area in which he wishes to work, creating his own bibliography for reflection, and finding his own channels to actively pursue the problem. The student must write a proposal identifying the manner in which he intends to involve himself in the study and then obtain the sponsorship of a faculty member. 4 to 12 credits.

Pre-Professional Programs

Students who are planning graduate study in medicine, dentistry, or law will find opportunities in the College of Liberal Arts for pre-professional preparation in these areas. Descriptions of these programs will be found on page 82.

Computer Courses

The University's Computation Center operates IBM 1620 and IBM 360/40 computers for teaching and research and for many of its business functions. The availability of these computers makes it possible to offer instruction in their operation. The Department of Mathematics lists a number of courses in the use of digital computers and in programming.

Marine Science and Technology

The University has a history of interest and activity in marine science dating from the 1930's. Marine interest has recently been intensified and has been extended to include ocean engineering.

The nearby salt water of the ocean, together with the waters of the Great Bay estuary system, form a natural and versatile setting for research in geology, the life sciences, and engineering. The new Jackson Estuarine Laboratory, completed in 1968, will serve as a center for estuarine and other marine research. Plans are being made, through arrangements with state and other agencies, to develop marine educational facilities on the Atlantic shore and at the Isles of Shoals which are ten miles off coast.

Marine Science

Students wishing to prepare themselves for careers in marine science should enroll in one of the standard science disciplines. They should consider the following courses which are available to undergraduates: (1) In botany — introduction to biological oceanography and marine ecology, and marine phycology; (2) In geology — introduction to oceanography, geological oceanography, mineralogy of clays, principles of geochemistry, sedimentation-stratigraphy, estuarine and marine sedimentation; (3) In microbiology — public health and sanitation, general microbiology and marine microbiology; and (4) In zoology — principles of ecology, comparative endocrinology, natural history of cold-blooded vertebrates, marine ecology, invertebrate zoology, protozoology, the host-parasite relationship, comparative physiology, and invertebrate embryology. The Jackson Estuarine Laboratory functions as a research facility for the marine science program.

Ocean Engineering

Study and research in the application of engineering to ocean exploration and exploitation are centered in the Engineering Design and Analysis Laboratory (EDAL). EDAL is an interdisciplinary faculty group, mainly from the College of Technology. Early in its history, this group chose to make ocean-oriented engineering its principal, but not exclusive, interest. The stated purpose of EDAL is to involve both faculty and students in realistic and challenging engineering projects. Projects thus far accomplished have made both EDAL-associated faculty and students participants in advanced marine-oriented engineering.

Undergraduates have become involved in ocean work by associating themselves with professors or graduate students, by participating in summer research cruises, by acting as assistants in campus-based research projects during the academic year or summer months, and by participating in the senior engineering projects course.

Students who wish to join in EDAL activities should enroll in one of the standard engineering disciplines. Marine science courses in one of the other colleges may be elected by the student in consultation with his engineering department faculty adviser.

Description of Courses

IBM Key Codes

The following numbers are used extensively in machine-processed data to identify both undergraduate and graduate programs offered at the University. An asterisk preceding the number identifies those departments which offer graduate programs.

College of Liberal Arts

40 Liberal Arts non-departmental
41 Biological Sciences Division
42 Education Division
43 Humanities Division
44 Physical Sciences Division
45 Social Sciences Division
46 The Arts
*47 Microbiology
*48 Education
*49 English
50 Geography
*51 Geology
*52 Political Science
*53 History
55 Classics
*56 French
*57 German
58 Greek
59 Italian
60 Latin
61 Russian
*62 Spanish
*63 Music
64 Music Education
66 Philosophy
*67 Psychology
*68 Sociology
69 Speech and Drama
*70 Zoology

Division of Health Studies

54 Nursing
65 Occupational Therapy
90 Men's Physical Education
91 Women's Physical Education

College of Agriculture

20 Agriculture non-departmental
*21 Resource Economics
*22 Agricultural and Extension Education
*23 Soil and Water Science
*25 Animal Sciences
*26 Biochemistry
*27 Botany
*29 Entomology
*30 Forestry
*31 Home Economics
*32 Plant Sciences

College of Technology

79 Technology non-departmental
*80 Chemical Engineering
*81 Chemistry
*82 Civil Engineering
*83 Electrical Engineering
*84 Mathematics
*85 Mechanical Engineering
*86 Physics

Whittemore School of Business and Economics

*71 Administration
*72 Economics
73 Secretarial Studies
74 Hotel Administration

Separate Departments and Programs

*97 Genetics Program
98 Military Service
99 Aerospace Studies

Explanation of Arrangement

The title, in capital letters, and the Arabic numeral designate the particular course. Odd numerals indicate courses normally offered in the first semester; even numerals indicate courses normally offered in the second semester. Numerals enclosed in parentheses indicate that course is repeated in the semester following. Thus course 401 (401) is offered in the first semester and is repeated in the second semester. Parentheses are also used to designate courses out of semester sequence. For example, (404) indicates an even-numbered course offered in the first semester. The course description is followed by the prerequisites, if any, and the number of semester credits the course will count in the total required for graduation. Laboratory periods are usually two and one-half hours in length, lectures either 50 minutes or 80 minutes in length.

NLG following the description indicates that the course carries *no letter grade*, being market "Cr" for credit, "F" for failure. All courses (unless otherwise marked) are open to students who have passed the prerequisites. An elective course may be given only when there is a minimum of five students registered.

If the course numerals are connected by a hyphen, the first semester, or its equivalent, is a prerequisite to the second semester. If the numerals are separated by a comma, properly qualified students may take the second semester without having had the first.

Students must register for the number of credits or within the range of credits shown in the catalog description of a course.

The system of numeric designation of courses is as follows:

200–299 Courses in the Thompson School of Applied Science.

300–399 Non-credit courses, e.g., Mathematics 301.

400–499 Introductory courses not carrying prerequisites and courses generally falling within University and college requirements.

500–599 Intermediate-level courses for undergraduate credit only.

600–699 Advanced-level undergraduate courses. Entrance to courses numbered 600 and above normally requires junior standing. (Under some conditions these courses may be taken for graduate credit by non-majors only.)

700–799 Advanced-level undergraduate courses. (These courses may be taken for graduate credit.)

800–899 Courses which carry graduate credit only. (Descriptions will be found in the Graduate School catalog.)

Administration (71)

517. Financial Accounting
A general introduction to the objective, theories, conventions, and processes for portraying and communicating the financial status and progress of the business enterprise. (Not open to students who have had Business Administration 401-402, 405, or 502.) 4 credits. Not open to administration majors.

519. Managerial Control
This course is designed to acquaint the student with the principles, theory, and practice of control in business enterprise. Concentrates on controls internal to a given business but includes controls imposed upon it by its economic, political, and other environments. Prerequisite: permission of the instructor. Not open to students who have had Business Administration 508 or 607. 4 credits. Not open to administration majors.

601-602. Values in a Managerial Society
A critical examination of the values which appear to underlie our managerial society and of the processes by which such values are formed and modified. Such basically Eighteenth Century ideas as pursuit of self-interest, desirability of material progress, and individualism which have loomed so large among American values, and how well they relate to our present managerial society. Some emerging alternatives to these long-accepted values are considered. The course runs throughout the year as a half-course in each semester. It is based primarily on discussions of cases and readings. There are a few lectures. Prerequisite: administration major or by permission of the instructor.

605-606. Quantitative Analysis I and II
The basic quantitative techniques for modern administrative analysis. The course will be concerned with models used in decision-making under conditions of certainty and uncertainty. Computer utilization will be integrated into the problem solving approach to these topics. Prerequisite: Mathematics 415 and administration major, or permission of the instructor. 4 credits each.

611-612. Organizational Behavior
A two-semester sequence designed to provide students with exposure to appropriate behavioral science concepts and the opportunity to apply them. It is based on the conviction that the student will learn best and most by using his knowledge as he acquires it. Students are expected to use their developing skills to take responsibility for the effect of their behavior on their learning environment. In the first semester the focus is on the class as a real organization with attention to roles, norms, rewards, and leadership. In the second semester the student will be helped to locate outside organizations to which he can become an observer or consultant. Prerequisite: administration major or permission of the instructor. 2 credits each.

614. Organizational Theory
An analysis of major theories of formal organization with particular stress on the relevancy of these theories to the analysis and administration of various type organizations, e.g., business, schools, hospitals, social agencies. Participation in class discussions and individually written commentary on theoretical readings is required. Occasional field work should be anticipated. Prerequisite: administration major or permission of the instructor. 4 credits.

617. Financial Reporting, Accounting, and Control (FRAC)
An integrated view of accounting, control, and economic models applicable to organizations for purposes of reporting performance, planning and reviewing operations, and making decisions. Prerequisite: administration major or permission of the instructor. 4 credits.

630. Investments
The problems of investment; investment characteristics of stocks and bonds; public utility, railroad, industrial, and government securities; protection of the investor; investment banking; and related problems. Prerequisite: Economics 402 and permission of the instructor. 4 credits.

647-648. Commercial Law
The law of contracts, agency, sales, negotiable instruments, partnerships, and corporations. Prerequisite: at least junior status and permission of instructor. 2 credits each.

650. Production Management
Principles of production organization, product design, materials acquisition, layout, production engineering, mechanization, production scheduling, and control. Prerequisite: permission of the instructor. 4 credits.

651. Marketing
A study of the marketing behavior of the firm as it supplies goods and services to consumers and industrial users. Attention is paid to the optimal blending of the ingredients in the "marketing mix", including product design, product line policies, packaging, branding, pricing, promotion, and selection of the channels of distribution. Prerequisite: Economics 402 and permission of instructor. Not open to students who have had Business Administration 525 or 625. 4 credits.

653. Financial Management
A study of the firm's uses and sources of funds with emphasis on working capital management, capital budgeting, and the administration of debt and equity. Prerequisite: Economics 402 and Business Administration 502. 4 credits.

695-696. Independent Study
Individual study projects of special interest and benefit to the student. Permission to pursue an independent study project is required from the student's adviser, proposed project instructor, and the Executive Committee. Permission will be granted only to students who have demonstrated superior scholastic achievement. 3-12 credits per semester.

700. Business Policy
Administrative practice of business management; use of business tools; processes of integrating operations, administering business systems, selecting goals and objectives, and formulating policy. Prerequisite: Senior standing and permission of instructor. 4 credits.

705. Operations Research
Mathematical programming, game theory, inventory, queuing, and scheduling problems; dynamic programming. 4 credits.

711. Corporations
The role of the modern corporation in the economy. Emphasis upon structure of the corporation, the corporate system, combinations, and concentration. Prerequisite: Economics 402. 4 credits.

712. Organizational Change
Examination of the process of change in organizations. Consideration of change strategies, the role of the change agent, and his relation to the client system. The bases of resistance to change and the problems encountered by internal and external change agents. Readings include theoretical material on influence and attitude change as well as organizational change. 4 credits.

713. Interpersonal and Group Dynamics
Intensive, experiential study of the dynamics of small groups through the use of the class itself as a laboratory study group. Students review readings in small group theory, role theory, and such group dynamics variables as communication patterns, norms, adaptation and coping mechanism, role conflict, and multi-group membership. Prerequisite: Permission of the instructor. 4 credits.

717. Advanced Financial Accounting
Accounting theory and practice as they contribute to the significance and limita-

tions of the financial statements by which business communicates financial status to interested outsiders. Prerequisite: Permission of instructor. 4 credits.

718. Cost and Management
The effective use of cost accounting, cost analysis, and budgeting in planning and controlling operations. Topics considered include analysis of cost behavior, direct and absorption costing, cost-price-volume relationship, distribution costs, transfer pricing, and capital expenditure analysis. 4 credits.

719. Control and Information Systems
The concepts of systems, their use in enterprise management, and the role and influence of on-line control systems; the nature and uses of information in management. The course includes materials intended to familiarize the student with information theory and technology. 4 credits.

730. Investments Analysis
An evaluation of capital markets and of analytical techniques useful for security appraisal. The following subjects will be covered: securities characteristics, market institutions, yield structures, price change patterns, intrinsic value analysis, investment timing, and portfolio management. Lectures, outside readings, and security analysis research projects are the main tools of the course. Prerequisite: Business Administration 502 or permission of instructor. 4 credits.

741. Transportation Economics
Competitive characteristics of the several modes of transport. National transportation policy. Limited consideration of transportation as a function of business. Prerequisite: Economics 402 or permission of instructor. 4 credits.

749. Federal Taxation
Current federal income, estate, and gift taxes and their impact on corporations, partnerships, and individuals. Prerequisite: Permission of instructor. 2 credits.

751. Advertising and Promotion
How the modern firm employs advertising and other promotional tools to help solve marketing problems with special emphasis on advertising as a medium of communications and as a social-cultural force in the western world. Prerequisite: Business Administration 625. 4 credits.

752. Marketing Research
Marketing research is concerned with the search for and analysis of information relevant to the identification and solution of marketing problems. The study of the techniques used in this search — their strengths and limitations — together with the environment in which the search is conducted. The primary aim is to enable one to better understand the problems that arise in this search and to better evaluate the results of such research. Prerequisite: Administration 651 and 605 or their equivalent. 4 credits.

753. Comparative Marketing (Innovations and Dynamic Aspects of Marketing)
In marketing the problems related to the acceptance of new products, new brands, and new services are becoming more and more important. The course deals with the diffusion of innovations. Factors governing the speed and ways in which products become accepted in different societies are treated and so are the related dynamic aspects of competition. Methods are presented for studying loyalty behavior, the acceptance process, the role of innovators and group influence. International examples are used and emphasis is placed on the implication for marketing policies. Prerequisite: Administration 651, Business Administration 625 or permission of instructor. 4 credits.

755. Advanced Financial Management
A study of financial policy of the firm with emphasis on solutions to complex problems of capital, leverage, optimal capital structure, capital budgeting, and working capital management. Prerequi-

site: Permission of the instructor. 4 credits.

776. Consumer Behavior
The consumer-firm relationship studied in terms of concepts drawn from contemporary social science findings, particularly small group studies, as related to present and prospective marketing activities of a business organization. 4 credits.

798. Seminar in Business Problems
Special topics in business administration. This course may be repeated. Prerequisite: Consent of the adviser and the instructor. Credits to be arranged.

Agricultural Education (22)

William H. Annis, *Associate Professor and Program Supervisor;* Samuel Hoitt. *Professor;* Paul A. Gilman, *Associate Professor;* Jesse James, *Associate Professor*

402. Fabrication Technology
A study of welding, cold metal working, sheet metal working, wood working, and plastics as it relates to the building or repair of structures and machines. 2 recitations and 2 laboratories. 4 credits.

650. Principles of Agricultural Education
The technical and professional qualifications of teachers of agriculture, 4-H youth development agents, and county agricultural agents. The federal and state legislation affecting these programs at the local level. Two field trips to schools and/or extension meetings are required. 4 credits.

652. Methods of Teaching Agricultural Mechanics
The organization and presentation of the agricultural mechanics curriculum to meet individual and group needs. Project direction and supervision, and the preparation, and presentation of demonstrations. Required of those who wish to teach in the Agricultural mechanics curriculum. 1 recitation and 1 laboratory. 2 credits.

783. Preparation for Conducting and Supervising Adult Education Programs
The techniques of adult education in terms of identifying needs, program planning, methods of teaching, supervision, and evaluation. Prerequisite: Agricultural Education 650 or permission of instructor. 4 credits.

785. Advanced Methods and Materials of Instruction
The organization of instruction to meet individual and student needs; development and use of resource files and instructional materials. Evaluation in teaching vocational-technical education. Open to teachers of vocational-technical education and others by permission of instructor. 4 credits.

786. Concepts of Vocational-Technical Education
The development of vocational-technical education in the United States with emphasis on the socio-economic influences responsible for its establishment. The federal and state requirements for programs on the secondary and post-secondary schools will be discussed. Coordination of programs with general education and other vocational fields. 4 credits.

791. Planning for Teaching
The organization of materials of instruction to meet group and individual needs. Techniques of instruction, planning for teaching, the function of consulting committees, working with youth groups, and program evaluation. This course is scheduled concurrently with Education 758, 759, and 794. Prerequisite: Agricultural Education 650 or permission of instructor. 4 credits.

796. Investigation in (1) Vocational Education (2) Extension Education (3) Adult Education
An opportunity is provided for a student to study a special problem in one of the areas listed elective after consultation with the instructor. Hours to be arranged. 2 or 4 credits. May be repeated.

Animal Sciences (25)

(Animal, Dairy, Poultry, Pre-Veterinary) Winthrop C. Skoglund, *Professor and Chairman;* Kenneth S. Morrow, *Professor Emeritus;* Loring V. Tirrell, *Professor Emeritus;* Fred E. Allen, *Professor;* C. Hilton Boynton, *Professor;* Walter M. Collins, *Professor;* Nicholas F. Colovos, *Professor;* William R. Dunlop, *Professor;* Harry A. Keener, *Professor;* Richard C. Ringrose, *Professor;* Alan C. Corbett, *Associate Professor;* James B. Holter, *Associate Professor;* Herbert C. Moore, *Associate Professor;* Gerald L. Smith, *Associate Professor;* Samuel C. Smith, *Associate Professor;* Richard G. Strout, *Associate Professor;* Arnold K. Fowler, *Assistant Professor;* Joseph T. Riker III, *Assistant Professor;* Janet C. Briggs, *Instructor*

400. Animals, Food and Man
Historical, biological, economic, social, and political role of animals and foods derived from them in the evolution of civilizations and societies composed of man as a biological entity. Open to all students. Staff. 3 lectures, 1 laboratory, 4 credits.

401. Introduction to the Animal Sciences
To acquaint the beginning student with the development, economic importance, and problems facing the livestock industry. The commercially important classes of farm animals are discussed with emphasis on dairy cattle, poultry, beef cattle, horses, sheep, and swine. The place of the biological sciences in the rapidly changing animal agriculture is stressed. The course is intended to be the introduction to subsequent specialized courses and gives the student an insight into opportunities in the animal agriculture field. Mr. G. L. Smith and staff. 3 lectures, 1 laboratory, 4 credits.

402 (402). Horsemanship
Instruction in riding using University-owned Morgans under supervision of a riding instructor. A limited number of students may stable their horses at the University. This course can also be taken as an elective in physical education. Three hours of riding per week for which a fee of $35 per quarter is charged. Mrs. Briggs. 1 credit.

501. Animal Anatomy and Physiology
The general anatomy and physiology of domestic animals and birds. Mr. Allen. 3 lectures, 1 laboratory, 4 credits.

502. Fundamentals of Animal Health
The prevention, control, and treatment of the bacterial and parasite diseases of domestic animals. Mr. Allen. Prerequisite: Animal Sciences 501 or permission of instructor. 3 lectures, 1 laboratory, 4 credits.

504. Meat and Its Products
Slaughtering, cutting, and identification of beef, lamb, pork, and poultry. Trips are taken to wholesale and retail meat outlets. Mr. G. L. Smith. 3 lectures, 1 laboratory, 4 credits.

506. Fundamentals of Animal Nutrition
Scientific principles of nutrition in both ruminants and non-ruminants. Mr. Ringrose. 3 lectures, 1 laboratory, 4 credits.

507 (507). The Scientific Approach to Equine Discipline
The physiological development, control, and education stressing bitting, longeing, and collection. Mrs. Briggs. Prerequisite: Animal Science 402 or equivalent and permission of instructor. 1 lecture, 1 laboratory, 2 credits.

508. Milk and Its Products
The composition and properties of milk, both chemical and bacteriological. The producing, making, handling, and marketing of milk and its products. Mr. Moore. 3 lectures, 1 laboratory, 4 credits.

601-602. Animal Selection
601-1 Livestock: Mr. Riker; 602-2 Dairy: Mr. Boynton; 602-3 Poultry: Mr. Collins. The principles of selection based on production performance, pedigree, and type evaluation. Elective only after consultation with instructor in charge. The student may repeat the course and select any or all of the specialized areas listed above. 1 lecture, 1 laboratory, 2 credits.

603. Applied Animal Nutrition
Application of scientific principles of nutrition to practical feed formulation and feeding systems for poultry and livestock. Mr. G. L. Smith and other staff members. 3 lectures, 1 laboratory. 4 credits.

612. Avian Health and Sanitation
A survey of the diseases of domestic fowl. Emphasizes the fundamentals of disease control including bacterial, fungus, helminths and protozoan parasites, and avian diseases caused by virus entities. Serological tests, virus isolation, and propagation in avian embryos and tissue culture will be conducted in the laboratory. Mr. Corbett and Mr. Strout. 3 lectures, 1 laboratory, 4 credits. (Alternate years; not offered in 1969-70.)

614. Diseases and Parasites of Wildlife
A survey of the diseases and parasites of fishes, birds and game, and fur-bearing animals. Discusses control of diseases as influenced by management practices, the effect of pesticides on wildlife, and the relationship of wildlife diseases to human health. Autopsy techniques, the proper handling of specimens, and the use of state laboratory facilities will be stressed in laboratory. Mr. Strout and other staff members. 3 lectures, 1 laboratory, 4 credits. Permission of instructor necessary.

651-652. Management of the Domestic Animals
651-1 Light Horses: Mr. Riker; 651-2 Dairy: Mr. Fairchild; 652-3 Livestock: Mr. G. L. Smith; 652-4 Poultry: Mr. Skoglund.
A study of the economic and management factors involved in the production of the various species of domestic animals. The student can select any or all of the specialized areas listed above. Elective only after consultation with the instructor in charge. 3 lectures, 1 laboratory, 4 credits.

653-654. Principles of Teaching Equitation
The techniques and procedures of teaching equitation. Application of the theories of riding and training with emphasis on dressage instruction. Opportunity will be given to teach riding theory and techniques to college students under the supervision of the head instructor. Must be taken for both semesters. Prerequisite: Animal Science 402, 507, and 651-1. Permission of instructor required. Mrs. Briggs. 3 lectures, 1 laboratory, 4 credits.

697 (697). Animal Science Seminar
A survey of recent literature and research in the animal sciences. Staff. 2 credits.

701. Physiology of Reproduction
A study of physiology, embryology, endocrinology, reproduction, and lactation in domestic animals. Mr. Fowler. 3 lectures, 1 laboratory, 4 credits.

702. Physiology of Milk Secretion
A study of the anatomical, physiological, and biochemical aspects of lactation including their interrelationships as they are involved in the normal and abnormal development, maintenance, and functioning of the mammary gland. Consideration will be given to environmental and physiological factors affecting lactation and to the ontogeny and phylogeny of

the mammary gland. Staff. 3 lectures, 1 laboratory, 4 credits.

708. Animal Genetics
Mendelian and quantitative inheritance in animals and principles and systems of selection. Prerequisite: 4 credits of genetics or permission of instructor. Mr. Collins. 3 lectures, 1 laboratory, 4 credits.

709. Monogastric Nutrition
Feeding of monogastric farm animals with emphasis upon nutrient requirements, feedstuffs composition, feed formulation, and feed utilization. Nutrition as related to management systems will also be considered. Staff. 3 lectures, 1 laboratory, 4 credits.

710. Ruminant Nutrition
Feeding and management of dairy animals, calf feeding, raising young stock, and feeding for economical milk production. Mr. Holter. 3 lectures, 1 laboratory, 4 credits.

795-796. Investigations in Dairy, Livestock, Poultry
1. Genetics: Mr. G. L. Smith, Mr. Collins, Mr. Boynton.
2. Nutrition: Mr. G. L. Smith, Mr. Ringrose, Mr. Colovos, Mr. Holter.
3. Management: Mr. G. L. Smith, Mr. Skoglund, Mr. Boynton, Mr. Riker.
4. Diseases: Mr. Allen, Mr. Corbett, Mr. Dunlop, Mr. Strout, Mr. S. C. Smith.
5. Products: Mr. G. L. Smith, Mr. Moore.
6. Light Horsemanship: Mr. Riker, Mrs. Briggs.
7. Physiology: Mr. Fowler, Mr. Riker.
An opportunity is given for the student to select a special problem in any of the fields listed under the guidance of the instructor. Elective only after consultation with the instructor in charge. 2 credits. May be repeated.

The Arts (46)

George R. Thomas, *Professor and Chairman;* John W. Hatch, *Professor;* James A. Fasanelli, *Associate Professor;* John Laurent, *Associate Professor;* Richard D. Merritt, *Associate Professor;* Alfred R. Potter, *Associate Professor;* Winifred Clark Shaw, *Associate Professor;* Dirk Bach, *Assistant Professor;* Arthur Balderacchi, *Assistant Professor;* Peter Moak, *Assistant Professor;* Daniel L. Valenza, *Assistant Professor;* Samuel Cady, *Instructor;* Mary Koehl Chase, *Instructor;* Jayne Dwyer, *Instructor;* Joan Esch, *Visiting Lecturer;* Gerda Peterich, *Visiting Lecturer;* William F. McLane, *Visiting Instructor*

The Department of The Arts presents a series of changing exhibitions in the galleries in Paul Creative Arts Center and the Exhibition Corridor in Hewitt Hall. Within a convenient radius of Durham are located a number of the country's important collections of art which students are encouraged to visit. Among these are: the Addison Gallery of American Art, the Currier Gallery of Art, the DeCordova and Dana Museum, the Lamont Gallery, several excellent museums and galleries in Boston, including the Museum of Fine Arts, the Gardner Museum, the Fogg Museum of Harvard University, and the Institute of Contemporary Art.

The Student Workshop is an unstructured creative activity, located in Hewitt Hall and open to the university community during the two academic semesters. This shop is well equipped and provides a wide variety of experiences with wood and wood related media. The underlying philosophy of the Student Workshop is providing a means for solving problems, whether they be pragmatic or aesthetic. In those art courses where the student retains the finished work, he pays the cost of materials and supplies used. The University reserves the right to choose to exhibit a student's work for a period of not more than two years.

Students are responsible for the care of shops, studios, and all equipment therein; damage resulting through negligence or carelessness will be the responsibility

of the student. Tools and other equipment will not be used until instruction in their use is given by the member of the staff in charge. Unless specifically authorized by the Chairman of the Department, projects not a part of the instructional program must be excluded from the studios.

Crafts

401. Ceramics, Introduction to Hand-Building Construction
Exploration of stoneware clay as material for building coil and slab construction. The course includes experimentation with three dimensional forms, glaze application and techniques for decoration, and stacking and firing of gas and electric kilns. Mr. Potter. Elective by permission. 1 four-hour laboratory, 8 hours unscheduled in laboratory, 4 credits. Course fee for materials, $12.00.

403. Ceramics, Introduction to the Potter's Wheel
Stoneware clay used for the introduction to the traditional usage of the potter's wheel. The course includes experimentation with functional container forms, introduction to materials for clay and glazes, glaze application and techniques for decoration, and stacking and firing of gas and electric kilns. Mr. Potter. Elective by permission. 1 four-hour laboratory, 8 hours unscheduled in laboratory, 4 credits. Course fee for materials, $12.00.

407. Crafts
Structural and decorative design and construction of objects using paper, wood, fabric, yarn, metal, leather, etc., which may be related to elementary and secondary art programs. For art education students. Mrs. Shaw. Elective by permission. 2 laboratories, 4 credits. Course fee for materials, $10.00.

413-414. Jewelry and Metalsmithing
Structural and decorative design and construction of jewelry, flatware, and hollow ware. Soldering, polishing, chasing, casting, raising, forging, fabrication and enameling metal (sterling silver, copper, brass, pewter) are included. Mrs. Shaw. Elective by permission. 2 laboratories, 4 credits. Course fee for materials, $10.00.

419-420. Weaving
An introductory course in hand weaving using 2-, 4-, or 8-harness loom and tapestry frame. Traditional patterns studied. Design and weaving of fabrics, table linens, rugs, and hangings. Mrs. Shaw. Elective by permission. 2 laboratories, 4 credits. Course fee for materials, $10.00.

425-426. Woodworking
A basic course in wood, integrating drawing and design work, woodworking techniques and theory, and the execution of a series of the students' own designs. Mr. Valenza. Elective by permission. 1 lecture, 2 laboratories, 4 credits. Course fee for materials, $10.00.

501-502. Ceramics, Intermediate Hand-Building Construction
Methods of hand construction used to develop personal creative expression in stoneware clay with specific projects recommended on an individual basis. Included will be glaze calculation to develop glaze color and textural effects on stoneware and porcelain. Extensive decoration techniques will be explored and individual responsibility for stacking and firing of kilns required. Mr. Potter. Prerequisite: Arts 401. Elective by permission. 1 four-hour laboratory, 8 hours unscheduled in laboratory, 4 credits. Course fee for materials, $12.00.

503-504. Ceramics, Intermediate Potter's Wheel
Advanced problems assigned to develop an individual philosophy regarding the forming of functional and non-functional vessels. Included will be glaze calculation to develop glaze color and textural effects on stoneware and porcelain. Extensive decoration techniques will be explored, and individual responsibility for firing and stacking of kilns is required. Mr. Potter. Prerequisite: Arts 403. Elective by permission. 1 four-hour labora-

tory, 8 hours unscheduled in laboratory, 4 credits. Course fee for materials, $12.00.

513-514. Intermediate Jewelry and Metalsmithing
Structural and decorative design and construction of jewelry and/or flatware and hollow ware as the student desires. Casting, stone setting and simple production methods emphasized. Mrs. Shaw. Prerequisite: Arts 414 and elective by permission. 1 lecture, laboratories to be arranged, 4 credits. Course fee for materials, $10.00.

525-526. Intermediate Woodworking and Furniture Design
Exploration in the design and construction of major furniture forms. Development of a portfolio of finished work, and investigations leading to a limited thesis. Mr. Valenza. Prerequisite: Arts 425-426. Elective by permission. 1 lecture, 2 laboratories, 4 credits. Course fee for materials, $15.00.

795. Independent Study — Crafts
Students in ceramics, jewelry and metalsmithing, weaving, or woodworking may select one of these areas for advanced studio work. Mrs. Shaw, Mr. Valenza, Mr. Potter. Permission required. Laboratories as arranged. 6 credits maximum. Course fee for materials varies.

Architecture, Design, Graphics, Painting, Photography, Sculpture

431. Basic Design
An introduction to two- and three-dimensional design. Elective by permission from department office. 2 laboratories, 4 credits. Course fee for materials, $3.00.

432. Drawing
An introduction to drawing. Elective by permission from department office. 2 laboratories, 4 credits. Course fee for materials, $1.00.

451. Introduction to Photography
The basic theory and practice of photography, covering equipment and materials, camera operation, developing, and printing. Creative solutions are sought to problems designed to increase the students perception. Mr. Merritt. Elective by permission. 1 lecture, 1 laboratory, 4 credits. Course fee for materials will approximate $16.00.

455. Drafting and Architectural Design
Basic drafting procedures, including lettering. Study of architectural symbols and interpretation of architectural plans. Problems of architectural design with emphasis on space utilization and space planning. Mr. Thomas. Elective by permission. 1 lecture, 2 laboratories, 4 credits.

457. Sculpture
Experimentation with three-dimensional forms in wood, stone, metal, and mixed-media. The use of carving chisels, pneumatic tools and welding torch to either cut down or build up compositions. The development of form, of volume, and of rhythm in space. Mr. Balderacchi. Elective by permission. 2 laboratories, 4 credits. Course fee for materials, $15.00.

536. Graphic Arts
Expression and experimentation in a variety of graphic techniques, i.e., linoleum and wood blocks, etching, lithography, etc., in black and white and color. Mr. Laurent and Mr. Cady. Prerequisite: Arts 432 and elective by permission. 2 laboratories, 4 credits. Course fee for materials, $12.00.

538. Graphic Design and Illustration
Design problems in various media and techniques emphasizing the fundamentals of typography, the conception and execution of illustrations, and printing processes and methods of reproduction. Elective by permission. 2 laboratories, 4 credits. Course fee for materials, $10.00.

541. Intermediate Drawing
An extensive course in drawing in studio and from nature; still life and figure drawing in pencil, pen and ink, chalk and

charcoal, etc. Objective drawing as a means of seeing and expressive use of the media will be stressed. Mr. Hatch, Mr. Laurent, and Mr. Cady. Prerequisite: Arts 432 and elective by permission. 2 laboratories, 4 credits.

542. Beginning Oil Painting
An introductory studio course in oil painting. Use of the media, color, and composition are studied in still life, figure, landscape, and conceptual assignments. Normally this course follows and continues the experience of Arts 541. Mr. Hatch, Mr. Laurent, and Mr. Cady. Prerequisite: Arts 431, Arts 432 and elective by permission. 2 laboratories, 4 credits.

544. Water Media
A studio course dealing with various water media, transparent and opaque, with emphasis on watercolor and inks. Tempera and polyvinal will also be introduced. Mr. Hatch. Prerequisite: Arts 432 and elective by permission. 2 laboratories, 4 credits.

551. Intermediate Photography
Introduction to the basic theory and practice of color photography. Discussions and demonstrations of special camera and laboratory controls for creative photography. Projects may be executed in black and white or color. A portfolio of photographs and a term paper will be required at the end of the semester. Mr. Merritt. Prerequisite: Arts 451 and elective by permission. 1 laboratory, 4 credits. Course fee for materials will approximate $20.00.

558. Intermediate Sculpture
A continuation of Arts 457 with special emphasis in producing sculpture in nonferrous metals through direct metal and cast-metal techniques. Independent experimentation and study. An inquiry into the origins of sculpture and an investigation of contemporary sculpture. Mr. Balderacchi. Prerequisite: Arts 457, and elective by permission. 2 laboratories, 4 credits. Course fee for materials, $20.00.

643, 644. Advanced Painting
An advanced studio course in which the student is expected to work independently in various media on assigned projects and with individual criticism. This course may be taken a second time with emphasis on the particular need of the individual. Mr. Laurent and Mr. Cady. Prerequisite: Previous painting experience and elective by permission. Laboratories arranged, 4 credits per semester. Course fee for materials varies.

650. Studio Workshop
A course including drawing, painting, photography, and printmaking designed to subject the advanced student to an intensive experience in at least three of these four disciplines. Prerequisites: Arts 451, 536, 541, 542, and elective by permission. 4 laboratories and 1 recitation, 4 credits per semester. Course fee for materials, $21.00.

796. Problems in the Visual Arts
Advanced students may select a special problem in one of the visual arts in which they have exhibited proficiency, to be developed by means of conferences and studio work. Prerequisite: Permission of department chairman. Credits to be arranged. This course may be repeated to a total of not more than 8 credits.

History of Art

475, 476. Introduction to The Arts
A broad historical survey of man's creative efforts in their relation to contemporary cultural and social movements, presented as a background for interpreting the place of the arts in individual and community life of today. Illustrated lectures with assigned readings. Prehistoric — Gothic, first semester; Gothic — Twentieth Century, second semester. 4 credits. Not open to freshmen.

583. Primitive and Oriental Art
An inquiry into the origins of art in prehistory, an investigation of the art of selected primitive cultures, and a study

of Oriental art concentrating on the pictorial development of China and Japan. This course is primarily concerned with the evolution of pictorial and sculptural images essentially foreign to the classic western tradition. Mr. Hatch. 4 credits. (Alternate years; not offered in 1969-70.)

585. American Architecture
A chronological survey of architecture in the United States from earliest Colonial times to the present. Architectural field trips in New Hampshire, Massachusetts, and Maine. Mr. Thomas. 4 credits. (Alternate years; offered in 1969-70.)

586. American Art
A chronological survey of painting and sculpture in the United States from the Colonial period to the present, with particular attention to works from collections in New Hampshire and Massachusetts. Mr. Moak. 4 credits.

588. Modern Art
A chronological survey of painting and sculpture in Europe from 1750 to the present. Mr. Moak. 4 credits.

591-592. History and Theory of the Film
A survey of film from its beginning in the 1890's to the present, and the literature, both critical and theoretical, that has grown up about the film. Although not exhaustive, this course covers documentary, feature, and experimental film. Historically oriented, this course will stress the relationship between film and the history of art. The first semester will survey film from the silent era to the beginnings of sound. The second semester will cover the development of the documentary film both here and in Europe, its impact upon the feature film made in Hollywood, and post-World War II developments. As in the first semester the films of Flaherty will be focused upon and his chronological development will be the historical framework for the course in the second semester. Although each semester can be taken by itself the course is conceived of as a unit covering a year's work. Mr. Fasanelli. 1 lecture, 2 recitations, 4 credits. Course fee, $10.00.

682. Classical Art
A survey of the monuments in Greece and Rome covering the following periods: archaic, classical and Hellenistic in Greece, and the area influenced by Greek culture; late Republican and Imperial Rome. Significant works from about the Mid-eighteenth Century B.C. to the Second and Third Centuries A.D. are analyzed chronologically. A comprehensive picture of the classical achievement, primarily in architecture and sculpture, and modern debts to the past. 4 credits. (Alternate years.)

684. Medieval Art
A survey of the vast material of the Middle Ages, from the First and Second Centuries A.D. to the Fourteenth Century, covering architecture, sculpture, mosaics, manuscripts, and the minor arts. The transitional character of this vast period will be stressed, as well as its dependence upon the antique past. Architecture and the more minor arts will be accented. 4 credits. (Alternate years).

685. The Art of the Renaissance
A historic survey of the achievements of Western civilization in sculpture, painting, and architecture from the Gothic cathedral to the Eighteenth Century drawing room. Illustrated lectures with assigned readings. Mr. Fasanelli. 4 credits. (Alternate years.)

686. Northern Painting
The development of painting in Flanders, France, and Germany from the late Fourteenth to the early Fifteenth Century. French manuscripts, Flemish painting in the Fifteenth Century, extant French monumental painting, German painting in the Fifteenth Century, and the dependence of this body of material on Flemish developments, as well as Italian. Mr. Fasanelli. 4 credits. (Alternate years.)

687. Baroque Art
An advanced course surveying architecture, sculpture, and paintings in the countries of western Europe in the Seventeenth and Eighteenth Centuries. The problem of the "Baroque" and the difficulty of defining an international style at a moment when national identities are strong. It is a companion to Arts (685), but is differently oriented. 4 credits. (Alternate years.)

(797). Seminar in Art History
Students electing to major in the history option must take this course at least once. The prerequisite is the completion of some work in any one of the survey courses offered in the option in the history of art. The seminar's aims are to direct further work in some area already studied. Introduction to advanced problems of a bibliographical, critical, and iconographical nature. The results of research are required in a formal paper. 4 credits.

Art Education

Art-Education 493. An Introduction to Art Education
An introductory course designed to provide the student interested in the teaching of art with an understanding of the philosophies, the problems, and the organization of an art program in the schools. Lecture, discussion, and studio. Prerequisite: Arts 431, Arts 432, and elective by permission. 2 credits. Course fee for materials, $5.00.

Art-Education 791. Problems of Teaching Art in Secondary Schools
The purpose and objectives of teaching art in the secondary schools; selection and organization of teaching materials; teaching techniques which may be advantageously employed in the secondary-school art program. Prerequisite: Education 757 and Art-Education 792 with a grade of C or better. 2 lectures, 1 laboratory, 4 credits.

Art-Education 792. Problems of Teaching Art in Elementary Schools
The purposes and objectives of teaching art in elementary schools; selection and organization of teaching materials; teaching techniques which may be advantageously employed in the elementary schools. Prerequisite: Education 757 and elective by permission. 1 lecture, 1 recitation, 2 laboratories. 4 credits.

Biochemistry (26)

Edward J. Herbst, *Professor and Chairman,* Thomas G. Phillips, *Professor Emeritus;* Stanley R. Shimer, *Professor Emeritus;* Arthur E. Teeri, *Professor;* Miyoshi Ikawa, *Professor;* Donald M. Green, *Professor;* Douglas G. Routley, *Associate Professor;* Samuel C. Smith, *Associate Professor;* Gerald L. Klippenstein, *Assistant Profesor;* James A. Stewart, *Assistant Professor*

301. Biological Chemistry
An introduction to biological chemistry. Mr. Teeri. Prerequisite: Chemistry 402 or 404. 3 lectures, 1 laboratory, 4 credits.

656. Physiological Chemistry and Nutrition
An introductory biochemistry course with emphasis on human physiological chemistry and nutrition. The laboratory includes a study of procedures basic to chemical methods used in medical diagnostic work. Mr. Teeri. Prerequisite: Satisfactory preparation in organic chemistry. 3 lectures, 1 laboratory, 4 credits.

699 (699). Senior Thesis
Participation in research in biochemistry. For seniors majoring in biochemistry who have completed Biochemistry 751. Staff. 2 credits.

751. Principles of Biochemistry
The fundamental principles of biochemistry with emphasis on the chemical properties, metabolic pathways and func-

tions of carbohydrates, lipids and nitrogenous compounds. Mr. Herbst, Mr. Ikawa, and staff. Prerequisite: One year of organic chemistry or permission of instructor. 4 lectures, 1 laboratory, 4 credits.

752. Topics in Biochemistry
A detailed consideration of metabolism and of current developments in biochemistry. Staff and guest lecturers. Prerequisite: Biochemistry 751. 2 lectures, 2 credits.

762. Plant Metabolism
The function, occurrence, synthesis, and degradation of plant constituents. Major emphasis is placed on respiration and photosynthesis and their relationhips to the metabolism of lipids and nitrogen compounds. Mr. Routley. Prerequisite: General biochemistry. 2 lectures, 2 laboratories, 2 or 4 credits.

770. Biochemical Genetics
The biochemical mechanisms of storage, replication, transmission, transcription, recombination, mutation, and expression of genetic information by cells and viruses. Mr. Green. Prerequisite: Biochemistry 751 or permission of instructor. 3 lectures, 1 laboratory, 4 credits.

795, 796. Investigations in Biochemistry
Staff. Prerequisite: Permission of instructor. Subject matter and hours to be arranged. 2 credits.

Biology (41)

401. Human Biology: Elementary Physiology
Human anatomy and physiology, excluding reproduction and endocrines. Mr. Lavoie. 4 credits. *No credit toward a major or minor.*

(402), 402. Man and His Environment
Elementary ecological considerations, exploring the impact of man on his living and non-living world; man's modification of his environment and its consequences. Mr. Milne. 4 credits. *No credit toward a major or minor.*

404. Heredity and Man
The genetic basis for variation, with emphasis on human inheritance. Topics include normal and abnormal chromosome complements, the mutable nature of the gene and its relation to expression, including genetic diseases, the distribution of genes in populations, and the role of this distribution and that of chromosomes to evolution and selection. Mr. Hoornbeek. 4 credits. *No credit toward a major or minor.*

407. Unresting Cells
A survey of the biology of animal cells, and how they reproduce and specialize to form the functioning adult organisms. Mr. Foret. 4 credits. *No credit toward a major or minor.*

409, (409). Human Reproductive Biology and Endocrinology
Consideration of all aspects of human sexuality from anatomical, physiological, and a variety of other view points. Emphasis on those aspects of greatest concern to college-age students. Mr. Wright. 4 credits. *No credit toward a major or minor.*

641, (641). General Ecology
Interrelationships between organisms and their physical environment, population growth, structure, and species interactions; introduction to the ecosystem: energetics, succession, and structure, with intensive study of selected examples. Staff of Botany and Zoology Departments. Prerequisite: One course in biology. 4 credits.

791. Problems in the Teaching of High-School Biology
Objectives and methods of teaching. The selection and organization of materials, preparation of visual aids, setting up of aquaria and other projects. The use of the field trip as a tool in teaching high-

school biology. Mr. Schaefer. Prerequisite: Two years of biological science and permission of instructor. 4 credits.

Botany (27)

Thomas E. Furman, *Associate Professor and Chairman;* Stuart Dunn, *Professor;* Albion R. Hodgdon, *Professor;* Charlotte G. Nast, *Professor;* Avery E. Rich, *Professor;* M. C. Richards, *Professor;* Richard Schreiber, *Professor;* Lorne A. McFadden, *Associate Professor;* Alex L. Shigo, *Adjunct Associate Professor;* Arthur C. Mathieson, *Assistant Professor;* Marion E. Mills, *Assistant Professor Emerita;* William H. Pawuk, *Instructor*

411. General Botany
An introduction to plant science. The evolution of structure and function in the plant kingdom. Required as a prerequisite for Zoology 412. Mr. Schreiber. 3 lectures, 1 laboratory, 4 credits.

503. The Plant World
A survey of the plant kingdom from an evolutionary point of view. The structure and function of plant parts. Miss Nast. Prerequisite: Biology 401 or Botany 411. 2 lectures, 2 laboratories, 4 credits.

566. Systematic Botany
The scientific basis of plant taxonomy and the identification and classification of our native trees, shrubs, and wild flowers. Mr. Hodgdon. Prerequisite: Biology 401 or Botany 411. 2 lectures, 2 laboratories, 4 credits.

567. Aquatic Plants
A survey of flowering plants, fern relatives, and Bryophytes found in and about bodies of water in northeastern United States. Extensive field work, preparation techniques, representative collections, herbarium work, lectures, and discussions. Mr. Hodgdon. Prerequisite: Botany 566. 1 lecture, 1 colloquium, 1 half day laboratory, 4 credits. (Alternate years; not offered in 1969-70.)

699 (699). Investigations in:
(1) Plant Physiology (Mr. Dunn); (2) Phycology (Mr. Mathieson); (3) Cytology (Mr. Schreiber); (4) Plant Ecology (Mr. Furman); (5) Plant Pathology (Mr. McFadden or Mr. Rich); (6) Systematic Botany (Mr. Hodgdon); (7) Plant Anatomy (Miss Nast); (8) Plant Morphology (Miss Nast); (9) Mycology (Mr. Richards); (10) Botanical Teaching (Staff)
Individual projects under faculty guidance. Elective only by permission of the appropriate instructor. Hours to be arranged. 2 or 4 credits, each semester.

706. Plant Physiology
Structure and properties of cells, tissues, and organs; absorption and movement of water; metabolism; growth and irritability. Mr. Dunn. Prerequisite: Botany 411 or 503 and one year of chemistry. 2 lectures, 2 laboratories, 4 credits.

721. Freshwater Phycology
Identification, classification, ecology, and life histories of the major groups of freshwater algae. Periodic field trips will be scheduled throughout the semester. Mr. Mathieson. Prerequisite: Botany 411 or 503. 2 lectures, 2 laboratories, 4 credits. (Alternate years; not offered in 1969-70.)

722. Marine Phycology
Identification, classification, ecology, and life histories of the major groups of marine algae. Particular emphasis will be placed upon the benthonic, marine algae of New England. Laboratories will include field trips during the latter portion of the course. Mr. Mathieson. Prerequisite: Botany 411 or 503. 2 lectures, 2 laboratories, 4 credits.

723. Introduction to Biological Oceanography and Marine Ecology
The distribution, abundance, and growth of marine plants in relation to their environment (chemical, physical, and biological). The students will be expected to attend regular planned field trips and to conduct an independent research pro-

ject. Mr. Mathieson. Prerequisite: Botany 722, Zoology 715, or permission of the instructor. 2 lectures, 1 laboratory and field trips, 4 credits. (Alternate years; offered in 1969-70.)

732. Cytology
The structure, physiological behavior, and development of cells. The cellular basis of heredity. Mr. Schreiber. Prerequisite: One year each of the biological sciences and of chemistry. 3 lectures, 1 seminar, 4 credits.

741. Plant Autecology
The interaction of the individual plant with its environment, including such factors as earth, air, fire, and water; and the resultant processes of symbiosis, adaptation, and evolution. Mr. Furman. Prerequisite: Botany 706 or permission of instructor. 1 lecture, 1 colloquium, 1 laboratory. 4 credits. (Alternate years; offered in 1969-70.)

742. Plant Synecology
The structure, development, and causes of distribution of plant communities. Methods of analysis and interpretation of field data. Laboratories include field trips on shared cost basis. Mr. Furman. Prerequisite: Botany 566 (or taken concurrently) or Forestry 425. 2 lectures, 1 outdoor laboratory, 4 credits.

751. Plant Pathology
The nature of disease in plants; the symptomatology, etiology, and classification of plant diseases. Mr. Rich. Prerequisite: Botany 411 or 503 or equivalent. 2 lectures, 2 laboratories, 4 credits.

752. Mycology
Studies of the parasitic and saprophytic fungi, their growth, reproduction, and identification. Mr. Richards. 1 lecture, 2 laboratories, 4 credits.

753. Forest Pathology
Forest and shade tree diseases; principles, etiology, epidemiology, and control. Mr. Pawuk. Prerequisite: Botany 411 or 503 or equivalent. 2 lectures, 2 laboratories, 4 credits.

754. Principles of Plant Disease Control
Exclusion, eradication, protection, immunization, and the specific practical methods used to control plant diseases. Mr. Rich. Prerequisite: Botany 751 or 753. 1 lecture, 2 laboratories, 4 credits. (Alternate years; offered in 1969-70.)

758. Plant Anatomy
The anatomy of vascular plants with special emphasis upon tissue development and structure. Miss Nast. Prerequisite: Botany 411 or 503. 2 lectures, 2 laboratories, 4 credits.

762. Morphology of the Vascular Plants
The life histories and evolution of the extinct and living vascular plants, including comparisons of general structure and sexual organs. Miss Nast. Prerequisite: Botany 411 or 503. 2 lectures, 2 laboratories, 4 credits. (Alternate years; not offered in 1969-70.)

765. Microtechnique
A methods course in embedding, sectioning, and staining plant tissues, and an introduction to microscopy. Miss Nast. Prerequisite: Botany 411 or 503. 2 lectures, 4 hours of laboratory, 4 credits. Permission of instructor.

767. Advanced Systematic Botany
The principles and rules of plant classification and nomenclature, study of plant families, field, and herbarium work. Mr. Hodgdon. Prerequisite: Botany 566. 1 lecture, 1 colloquium, 1 laboratory (full afternoon), 4 credits. (Alternate years; offered in 1969-70.)

797. Botany Seminar
Presentation and discussion of oral reports on research with practice in use of visual aids. Participation by all resident departmental majors. Botany Club in charge. 1 hourly session per week, 0 credit.

Chemical Engineering (80)

Oswald T. Zimmerman, *Professor and Chairman;* Irvin Lavine, *Professor Emeritus;* Stephen S. T. Fan, *Associate Professor;* David H. Chittenden, *Assistant Professor;* Henry M. Gehrhardt, *Assistant Professor;* Charles B. Schriver, *Assistant Professor;* Yin-Chao Yen, *Adiunct Associate Professor*

502. Chemical Engineering Principles I
The presentation and interpretation of engineering data; an introduction to systems of units, dimensional analysis, and heat and material balances. A study of chemical equilibrium and heats of reaction needed to describe systems undergoing chemical change; an intensive treatment of heat and material balances on complex systems. 4 credits.

601. Chemical Engineering Principles II
Transport phenomenon and stage operations. The equations of change as a basis for the study of molecular and turbulent transport of momentum, energy and mass, with emphasis upon the relation between the transport mechanism and the mathematical expression. Design principles and procedures for stagewise operations in various co-current and counter-current arrangements, based upon the ideal stage concept. Problems in both steady state and non-steady state operations. 3 lectures, 1 laboratory, regular lectures during reading period, 4 credits.

602. Chemical Engineering Principles III
Analysis of unit operations. Study of chemical engineering systems, with emphasis on the unit operations involved. Extension of previous studies of unit operations, and treatment of operations not previously considered. 3 lectures, 1 laboratory, regular lectures during reading period, 4 credits.

603. Chemical Engineering Principles IV
Mathematical techniques in chemical engineering applications; problem set-up emphasized; analytical, numerical and statistical methods; digital and analog computations of complex chemical engineering problems. 3 lectures, 1 laboratory, 4 credits.

604. Chemical Engineering Thermodynamics
The thermal properties of matter; the first law; the second law; useful thermodynamic functions; behavior of ideal and real gases and liquids; volumetric and phase behavior; cycles; steady flow processes; compression of gases; refrigeration and liquefaction of gases. 3 lectures, 1 recitation, regular lectures during reading period, 4 credits.

605. Chemical Engineering Principles IV
Correlated with 601-602, this course presents a unified theoretical treatment of momentum, heat, and mass transfer. 3 lectures, 1 recitation, 4 credits.

606. Chemical Engineering Kinetics
Chemical kinetics, catalysis, and introduction to reactor design. Study of types of kinetic behavior in chemical processes; prediction of reaction rates in batch and flow reactors with and without catalysis; and application to reactor design. 3 lectures, 1 laboratory, 4 credits.

607. Physical Metallurgy
An introductory study of the nature of metals, emphasizing the quantum mechanical description of the solid state and including atomic structure, bonding, historical development of metal theories, elementary zone or band theory, and X-ray diffraction. The microscopic metal system, thermodynamics of metallurgical processes, defects and dislocations, phase relations of pure metals and alloys, microstructure, and physical and thermal treatment of metals. Study of some nonmetals. 3 lectures, 1 laboratory, 4 credits.

608. Chemical Engineering Design
The principles of cost engineering, including estimation of plant investment, working capital, operating costs, labor requirements, payout time and profitability, value of money, capitalized costs, simple and compound interest, depreciation, taxes and insurance, overhead, financing of chemical enterprises, design of equipment and plants for minimum cost, plant location, transportation, sales cost, equipment cost, and cost indexes. Each class selects one or more problems involving the complete design of a chemical plant. For each problem, the most desirable process must be determined, the site selected, the equipment and plant designed, calculations made for all costs, profitability and payout time, and a complete report prepared, including the drawings of equipment and plant layout. 1 lecture, 3 laboratories, 4 credits.

695. Chemical Engineering Project
Each student selects a research problem which he carries out independently under faculty supervision. Intensive study in both the library and the laboratory and a satisfactory report upon completion of the work are required. 2-4 credits.

696. Independent Study
Individual study projects in various areas of chemical engineering as determined to be of particular interest and value to the student. Permission of the student's adviser and department chairman are required. Permission will be granted only to those students who have proved their ability by superior scholastic achievement. 1-4 credits.

701. High Polymers
Principles and practice of high polymer manufacture, including industrial polymerization methods and equipment design. Laboratory work includes typical polymerization reactions and the physical and chemical testing of various types of plastics and synthetic fibers. 3 lectures, 1 laboratory, 4 credits.

712. Introduction to Nuclear Engineering
The scientific and engineering development of nuclear reactors, including basic binding energy physics, nuclear stability, radioactivity, the elements of nuclear reactor theory, and the engineering problems of heat transfer, fluid flow, materials selection, and shielding. 4 credits.

713. Nuclear Chemical Technology
The design, construction, and operation of nuclear process equipment, including reactors and associated chemical processing facilities, and isotope separations plants. The technology of applied radiation chemistry. 3 credits.

752. Process Dynamics
A basic treatment of process dynamics, including a study of first and second order linear processes and their response to step and sinusoidol driving functions. Graphical analysis of the entire control system is included with special emphasis on the optimum design of a stable system. 3 credits.

762. Introduction to Optimization
Optimization techniques applied to functions not described analytically. Search techniques include Fibonacci search, golden section search, method of steepest ascent, method of contour tangents, and the method of parallel tangents. Stochastic schemes are considered. Advanced techniques for the optimization of objective functions are considered from a qualitative viewpoint. 3 credits.

Chemistry (81)

Alexander R. Amell, *Professor and Chairman;* Harold A. Iddles, *Professor Emeritus;* Albert F. Daggett, *Professor;* Helmut M. Haendler, *Professor;* Robert E. Lyle, Jr., *Professor;* Paul R. Jones, *Professor;* Frank L. Pilar, *Professor;* Charles M. Wheeler, Jr., *Associate Professor;* Albert K. Sawyer, *Associate Professor;*

Gloria G. Lyle, *Associate Professor*; Kenneth K. Andersen, *Associate Professor*; David W. Ellis, *Associate Professsor*; Charles W. Owens, *Associate Professor*; James D. Morrison, *Associate Professor*; James H. Weber, *Assistant Professor*; J. John Uebel, *Assistant Professor*; Charles V. Berney, *Assistant Professor*

401-402. General Chemistry
Elementary chemistry with lecture demonstrations and laboratory practice. Topics of interest to the professional student and of general interest are presented. For agriculture and home economics students and as an elective. 3 lectures, 1 laboratory, 4 credits. Cannot be used as prerequisite for other chemistry courses without permission.

403-404. General Chemistry
The fundamental laws and conceptions of chemistry, including a study of the nonmetals and metals and their compounds. The theoretical principles are illustrated by lecture demonstrations and the applications of chemistry in the professions are explained. For students who plan to take further courses in the Department of Chemistry. 3 lectures, 1 laboratory, 4 credits.

405. Introductory Chemistry
A discussion of the basic principles of chemistry, including atomic structure, bonding, equilibria, and thermodynamics, as the first course for chemistry majors. Presupposes secondary-school chemistry. 3 lectures, 2 laboratories, 4 credits.

406. Quantitative Analysis
A systematic treatment of the theory and techniques of volumetric and gravimetric analysis. The course is designed for those with a professional interest in chemistry. Normally this course will be followed later by an advanced course in instrumental methods of chemical analysis. (This course was formerly Chemistry 661.) Prerequisite: Chemistry 405 or 404. 3 lectures, 2 laboratories, 4 credits.

517. Quantitative Analysis
An introductory course in quantitative analysis, including gravimetric, volumetric, and instrumental methods, for those students desiring a brief terminal course in analytical chemistry. Mr. Ellis and assistants. Prerequisite: Chemistry 404. 2 lectures, 2 laboratories, 4 credits.

521. Semimicro Qualitative Analysis
The application of basic solution theory to ionic equilibrium and to the reactions of qualitative analysis. Problem work is required. The laboratory work provides experience in the application of theory to the analysis of simple and complex inorganic substances. Prerequisite: Chemistry 404. 2 lectures, 2 laboratories, 4 credits.

545. Organic Chemistry
An introductory but comprehensive study of the chemistry of carbon compounds with emphasis on the particular phases of the subject needed by students preparing to be technicians, nurses, majors in biological sciences, and others, where a brief course is desired. Prerequisite: Chemistry 404 or 406. Elective for medical technology, nursing, and pre-dental students, and majors in botany. 3 lectures, 2 laboratories, 4 credits. Students receiving credit for Chemistry 545 may not receive credit for Chemistry 547-548 or for Chemistry 651-652.

547-548. Organic Chemistry
The principal classes of organic compounds, aliphatic and aromatic, with emphasis on class reactions and structural theory. Laboratory exercises in the preparation and purification of selected organic compounds. The use of group reactions for the identification of organic substances in a systematic scheme of qualitative organic analysis. Mr. Jones, Mr. Andersen, and assistants. Prerequisite: Chemistry 404 or 406 or permission of instructor. 3 lectures, 2 laboratories, 4 credits. Students receiving credit for Chemistry 547-548 may not receive credit

for either Chemistry 545 or Chemistry 651-652.

651-652. Organic Chemistry
The principal classes of organic compounds, aliphatic and aromatic, with emphasis on class reactions and structural theory. Laboratory exercises in the preparation and purification of selected organic compounds. Mr. Andersen and assistants. Prerequisite: Chemistry 404 or 406 or permission of instructor. 3 lectures, 2 laboratories, 4 credits. Students receiving credit for Chemistry 651-652 may not receive credit for either Chemistry 545 or Chemistry 547-548.

661. Analytical Chemistry
A thorough treatment of the theory and techniques of gravimetric and volumetric analysis followed by special methods of analysis, such as ion exchange and EDTA titrations. Prerequisite: Chemistry 405-406 or equivalent. 3 lectures, 2 laboratories, 4 credits.

663. Introductory Radiochemical Techniques
Radiochemical techniques and laboratory practice in the use of apparatus in many fields of science which utilize radiochemical operations. Prerequisite: general inorganic chemistry and general physics. 3 lectures, 1 laboratory, 4 credits.

683-684. Physical Chemistry I, II
The properties of gases, liquids, and solids; thermochemistry and thermodynamics; solutions, chemical equilibria, reaction rates, conductance, and electromotive force. Mr. Wheeler. Prerequisite: Mathematics 523 or 426 and physics. Undergraduates must register for Chemistry 685-686 concurrently. 3 lectures, 2 credits.

685-686. Physical Chemistry Laboratory
Experimental work illustrating the principles of chemistry. Emphasis is upon the measurement of thermodynamic properties, chemical kinetics and methods of determining the structure of matter. Prerequisite: Mathematics 523 or 426 and physics. Must be taken concurrently with Chemistry 683-684. 2 laboratories, 2 credits.

696. Independent Study
With the consent of the adviser and the departmental chairman, an exceptional student may enroll in a course of independent study. This may consist of individual reading, writing, or laboratory work, which will be carried out under the tutelage of a faculty member. The course may be used to replace specific required courses in chemistry, with approval of the adviser and department chairman. Credits to be arranged.

697. Chemical Literature
The use of the chemical library as a research tool. Prerequisite: Chemistry 548 or 652. 1 credit.

698. Seminar
Student reports on topics of interest. Prerequisite: Chemistry 548 or 652 and 684. 1 credit.

699. Thesis
The related background and experimental observation of the year's investigation in some selected subject is required. Members of the staff. For seniors in chemistry who have completed Chemistry 548, 762, 684, and having a grade point average of 2.5, or permission of adviser and department chairman. 5 laboratories, 4 credits.

708. Research Techniques
Lectures and laboratory to show experimental methods and interpretation of results. Topics include gas liquid chromatography, data handling, nuclear magnetic resonance, mass spectrometry, elementary electronics, and X-ray. Staff. 1-3 credits.

755. Advanced Organic Chemistry
The preparation of organic compounds is studied with consideration being given to structural and stereochemical control of the reactions from a knowledge of the mechanism of the reaction. Emphasis is

on the solution of assigned problems. Prerequisite: one year of organic chemistry and physical chemistry or permission of instructor. 3 credit.

756. Characterization of Organic Compounds
The spectroscopic and chemical properties of organic compounds provide a basis for the systematic characterization of organic structures. Methods for the separation of mixtures of organic compounds are considered. Mr. Lyle and assistants. Prerequisite: one year of organic chemistry. 1 lecture, 2 laboratories. 3 credits.

762. Instrumental Analysis
A treatment of the theory, instrumentation, and application of electrical, optical, and other instrumental methods of chemical analysis, including emission spectrography, atomic absorption, spectrophotometry (visible, ultra violet, infrared), coulometry, potentiometry, polarography, conductimetry, electrophoresis, and gas chromatography. Prerequisite: Chemistry 406 or 661 and Chemistry 684 or concurrent registration or by permission of the instructor. 3 lectures, 2 laboratories, 4 credits.

775. Inorganic Chemistry
The relationship between chemical reactions and modern concepts of inorganic chemistry on a moderate level. The applicability and limitations of the newer ideas. Mr. Haendler or Mr. Weber. Prerequisite: Chemistry 683-684 or permission of instructor. 3 lectures, 1 laboratory, 4 credits.

776. Physical Chemistry III
Introduction to quantum theory; spectroscopy; chemical bonding; statistical thermodynamics. Prerequisite: Chemistry 683. 4 credits.

Civil Engineering (82)

J. Harold Zoller, *Professor and Chairman;* Russell R. Skelton, *Professor Emeritus;* Charles O. Dawson, *Professor;* Harold E. Langley, Jr., *Associate Professor;* Tung-Ming Wang, *Associate Professor;* Robert P. Vreeland, *Associate Professor;* Louis H. Klotz, *Associate Professor;* Gerald H. Batchelder, *Adjunct Associate Professor*

401-402. Engineering Statics and Computer Programming
Statics of rigid and deformable bodies with application to structural elements. Introduction to Fortran and problem solution by digital computation. 2 lectures, 2 credits.

501. Surveying
A course for non-civil engineering students in the theory and use of tape, level, transit, and aerial photographs in making plane and topographic surveys. Use of surveys as a basis for deeds, maps, construction, design, and reports envolving the use of land or other natural resources. No prerequisite. 2 lectures, 2 laboratories, 4 credits.

503. Dynamic Systems
Formulation and application of equations of motion of particles and rigid body systems. 2 lectures, 2 credits.

505. Surveying
Principles of land measurements by ground and photogrammetric methods. Application of error theory to planning and adjusting engineering surveys. Conformal mapping and its application to state plane coordinate systems. 2 lectures, 2 laboratories, 4 credits.

506. Strength of Structural Materials
An examination of stress and deformation theories applicable to structural materials with emphasis on elastic and plastic stress, strain, and failure phenomena. 4 lectures, 4 credits.

508. Engineering Graphics
Concepts and practice in orthographic projection and fundamentals of descriptive geometry. 2 laboratories, 2 credits.

621. Highway Engineering I
Principles of modern highway design, including traffic surveys, operations, geometric design, pavement design, performance, and maintenance. 4 lectures, 4 credits.

622. Engineering Materials
The structural properties and applications of the various materials used in civil engineering work, including steel, cement, mineral aggregates, concrete, timber, and bituminous materials. An introduction to the micro-structure and properties of common metals, plastics, and ceramics. 3 lectures, 1 laboratory, 4 credits.

642. Fluid Mechanics
Properties of fluids, fluid statics, flow of incompressible and compressible ideal fluids, flow of real fluids, and measurement of fluid properties. 3 lectures, 1 laboratory, 4 credits.

643. Sanitary Engineering I
The sources, quantity, quality, and sanitary aspects of public water supplies, including methods of purification and distribution systems; and the theory and problems of sewerage, methods of sewage treatment, and disposal of wastes. 4 lecture, 4 credits.

665. Soil Mechanics
Soil classification and physical properties. Permeability, compressibility, bearing capacity, settlement, and shear resistance are related to the principles underlying the behavior of soils subjected to various loading conditions. 3 lectures, 1 laboratory, 4 credits.

681. Structural Analysis I
The analytical stress and deflection analysis of determinate structures under static and moving load. Computer solution of beams and trusses by classical and matrix methods. 3 lectures, 1 design period, 4 credits.

682. Structural Design Concepts
The basic elements of design of structural members and their connections in steel and concrete. 3 lectures, 1 design period, 4 credits.

685. Indeterminate Structures
The analysis of indeterminate structures, including non-prismatic members, subject to static and moving loads. Solutions by classical, numerical, and computer applied methods. 3 lectures, 1 design period, 4 credits.

701. Advanced Surveying
Principles of instrumental and analytical photogrammetry. Theory of conformal mapping and its application to the state plane coordinate systems. Geodetic surveying. Error theory and its application to the planning and adjustment of surveys. Application of electronic computers to surveying calculations. 3 lectures, 1 laboratory, 4 credits.

707. Civil Engineering Materials in the United States
The origin and distribution of soils and rocks within the continental United States, and the influence of these natural materials on the design and construction of engineering works. The comparison of material characteristics and problems as to source and mode of occurrence. 4 lectures, 4 credits.

711. Community Planning
An introduction to community planning. Social, economic, and physical factors affecting community planning; content and extent of desirable community planning programs, including purpose and scope, preliminary survey, elements of land planning, the master plan, transportation and circulation systems, street patterns and traffic, motor vehicle parking, airport sites, public building sites, parks and recreational facilities, zoning, control of land subdivision, neighborhood and shopping centers, housing, legal,

financial and economic problems, and redevelopmental of blighted areas. Mr. Dawson. Prerequisite: permission of the instructor. 4 lectures, 4 credits.

714. Contracts, Specifications and Professional Relations
The essential elements and legal requirements of engineering contracts; the purposes and content of specifications; professional conduct, relations, registration, and ethics. Construction planning and management; cost analysis based on quantity surveys and unit cost methods. Mr. Dawson. Prerequisite: permission of the instructor. 4 lectures, 4 credits.

721. Highway Engineering II
Design of flexible and rigid pavements and bases for highways, airports, and city streets; pavement selection, construction methods, materials, specifications, and engineering cost estimates. Prerequisite: Civil Engineering 620 and 665. 3 lectures, 1 laboratory, 4 credits.

731. Network Planning and Scheduling
The application of critical path methods (CPM) and project evaluation review technique (PERT) to the design and control of engineering projects. 2 lectures, 2 credits.

732. Systems Analysis
An analysis of engineering projects encompassing social and economic criteria as well as engineering feasibility studies. 2 lectures, 2 credits.

744. Sanitary Engineering II
An advanced treatment of water supply and waste water disposal. 4 lectures, 4 credits.

745. Hydrology and Hydraulics
The occurrence and physical effects of water on the earth, including meteorology, ground water runoff and stream flow routing, open channel flow, reservoirs, control works, hydroelectric power, irrigation, drainage and multipurpose projects. 4 lectures, 4 credits.

765. Applied Soil Mechanics
Application of the principles of soil mechanics to selection of the type of substructure; determination of allowable soil bearing capacities based on rupture and settlement theories; determination of active and passive earth pressures; and foundation construction methods. Computations by classical, numerical, and computer applied methods. 4 lectures, 4 credits.

784. Introduction to Matrix and Numerical Methods
Presentation of a unifying concept of basic structural analysis theories, introduction to matrix and numerical methods of analysis, and their application by linear graph concepts using computers. 3 lectures, 1 design period, 4 credits.

793, 794. Advanced Structural Design I and II
The design in steel by elastic and plastic theories and in reinforced concrete by the working stress and ultimate strength methods for structural elements and connections using the appropriate controlling specifications. 3 lectures, 1 design period, 4 credits.

795-796. Independent Study
A limited number of qualified senior and graduate students will be permitted to pursue independent studies under faculty guidance. Seniors may write terminal theses reporting the results of their investigation. 2-4 credits.

Classics
(See Spanish and Classics)

Economics (72)

401. Principles of Economics (Macro)
An introduction to the basic functions of the United States economy viewed as a whole, together with policies designed to

affect its performance. The problem of economic scarcity, an introduction to supply and demand, the causes of unemployment and inflation, the nature of money and monetary policy, the impact of government taxation and spending, the federal debt, and issues concerning economic growth. No prerequisites. 4 credits.

402. Principles of Economics (Micro)
An introduction to the functions of the component units of the economy and their interrelations. The units of analysis are the individual consumer, the firm, and the industry. The theory of consumer demand and elasticity, supply and costs of production, theory of the firm under conditions of perfect and imperfect competition, the demand for and allocation of economic resources, general equilibrium, and basic principles and institutions of international trade. No prerequisites. 4 credits.

415. Economic History of the United States
The development of the United States economy from Colonial times to the present. Models of economic development and their applicability to the United States at various times. The role of social, political, and cultural factors in shaping the economy. Development and influence of economic institutions. No prerequisites: 4 credits. Cannot be taken by students who have taken Economics 403.

525. Introduction to Economic Statistics
Statistical techniques as an aid in decision-making. Includes methods of collection, analysis and presentation of statistical data, introduction to probability theory, statistical inference, regression analysis, index numbers, and time series analysis. 4 credits.

605. Intermediate Economic Analysis
Analysis of supply and demand. The determination of prices, production, and the distribution of income in non-competitive situations as well as in the purely competitive model. General equilibrium. Prerequisite: Economics 402. 4 credits.

611. National Income Analysis
Macro-economic measurement, theory, and public policy determination. Prerequisite: Economics 401-402. 4 credits.

615. History of Economic Thought
The evolution of economic thought, including the work of contemporary economists. Examination and critical appraisal of the work of major economists and major schools of economists, particularly with reference to the applicability of their theories to current economic problems. Prerequisite: Economics 401-402. 4 credits.

621. Economic Development
An analysis of the problems and available solutions confronting the underdeveloped areas of the world. Prerequisite: Economics 401-402. 4 credits.

630. Comparative Study of Economic Systems
An examination of socialism, communism, capitalism, and modifications of these economic systems, particularly as exemplified by the Soviet Union, China, Yugoslavia, France, the United Kingdom, and the United States. Prerequisite: Economics 401-402. 4 credits.

635. Money and Banking
An analysis of money, its supply, demand, impact on the economy, and control by the central bank. Prerequisite: Economics 401-402. 4 credits.

641. Public Finance
Problems and policies of expenditure, revenue, and debt of the public sector. Economic analysis and evaluation of tax systems and governmental fiscal programs. Prerequisite: Economics 401-402. 4 credits.

645. International Trade and Finance
Theory of international trade, foreign exchange, balance of payments, tariffs,

and protection. The economic aspects of international relations, with particular reference to recent policies. Prerequisite: Economics 401-402. 4 credits.

651. Government Regulation of Business
The role of government in economic affairs, with emphasis on mergers, competition, monopoly and the regulated industries. No prerequisites. 4 credits.

655. Trade Unions and Industrial Management
Trade union history, philosophy, and policies. Historical development of management attitudes and the attitudes of law and legislation toward unions. Collective bargaining: its nature, purpose, and public policy considerations. Prerequisite: Economics 401-402. 4 credits.

656. Labor Economics
Application of the tools of economic analysis to the market for labor. Wage determination and wage policy under union and non-union conditions. The determination of factor shares of the national income with particular emphasis on labor's share. Prerequisite: Economics 402. 4 credits.

695-696. Independent Study
Individual study projects of special interest and benefit to the student. Permission to pursue an independent study project is required from the student's adviser, proposed project instructor, and the Executive Committee. Permission will be granted only to students who have demonstrated superior scholastic achievement. 3-12 credits per semester.

711. Economic Fluctuations
The study of recurrent movements of prosperity and depression, with emphasis upon causes and public implications. Prerequisite: Economics 675, 611, or permission of instructor. 4 credits.

720. U. S. Economic History
The development of the United States economy from Colonial times to the present. Presentation and application of economic models and interpretation of data are stressed. The influence of capital accumulation, industrialization, foreign trade, monetary factors, and government are considered, with peripheral attention to non-economic factors. Primarily a course in applied economic theory. Prerequisites: Economics 673, 675, or consent of the instructor. 4 credits.

721. European Economic History
The development of Western European and Mediterranean economics from medieval times to the common market. Presentation and application of economic models and interpretation of data are stressed. Attention is centered on capital accumulation, technology, trade, industrialization, monetary factors, and the role of government, but the influence of non-economic factors is discussed where relevant. Prerequisites: Economics 673, 675, or consent of the instructor. 4 credits.

725. Statistical Theory
The theoretical basis of statistical methods, probability, probability distributions, statistical inference, and decisions. Prerequisite: permission of instructor. 4 credits.

726. Mathematical Economics
An introduction to the principal mathematical techniques and their application in economics. Prerequisite: permission of instructor. 4 credits.

727. Introduction to Econometrics
The application of statistics and mathematics to economic problems. The formulation of economic models, their measurement, and verification. Prerequisite: permission of instructor. 4 credits.

728. Statistical Decision Making
The application of probability and statistics to decision problems. Special emphasis on the Bayesian approach to decisions under uncertainty. Prerequisite: permission of instructor. 4 credits.

735. Advanced Money and Banking
Emphasis on central banking, monetary policy, and monetary theory. Study of current problems and developments in banking. 4 credits.

750. Imperfect Competition
Extensive survey of firm behavior in imperfectly competitive market forms, such as monopoly and oligopoly. The implications for price and research performance under such market forms are examined and the relevance of the theoretical arguments are assessed by recourse to appropriate empirical studies. Prerequisite: Economics 673 or permission of the instructor. 4 credits.

757. Public Policy in Social and Labor Legislation
American social and labor legislation of the recent decades and the way in which American economic and human values have been implemented and modified by law. Legislation and private industry programs in social security, reemployment, unemployment insurances, health services, training and retraining, and fair employment practice. Lectures, discussion, assigned reading, and individual student projects. Prerequisite: one year's work in economics or sociology. Mr. McConnell. 4 credits. (This course is the same as Sociology 727.)

Education (48)

Roland B. Kimball, *Professor and Chairman;* Thomas O. Marshall, *Professor;* Carleton P. Menge, *Professor;* David D. Draves, *Associate Professor;* Walter N. Durost, *Associate Professor;* Joseph J. Petroski, *Associate Professor;* Angelo V. Boy, *Associate Professor;* Gerald J. Pine, *Associate Professor;* Roselmina Indrisano, *Associate Professor;* John G. Chaltas, *Associate Professor;* M. Daniel Smith, *Associate Professor;* Bud B. Khleif, *Associate Professor;* Deborah E. Stone, *Assistant Professor;* Michael D. Andrew, *Assistant Professor;* Jason E. Boynton, *Assistant Professor;* Carl J. Cooper, *Assistant Professor;* Philip M. Smith, *Assistant Professor;* Philip E. Northway, *Assistant Professor;* W. Dwight Webb, *Assistant Professor;* David J. Hebert, *Assistant Professor;* Albert Elwell, *Assistant Professor;* Catherine L. Noonan, *Assistant Professor;* Judith A. Meagher, *Assistant Professor;* Marvin A. Seperson, *Instructor;* John Loughlin, *Instructor;* John D. Bardwell, *Lecturer;* Paul Spilios, *Lecturer;* Claire Wright, *Lecturer;* John E. Splaine, *Assistant to the Chairman*

Ernst O. Forster, *Instructor* (Education and Languages); George F. Griewank, *Instructor* (Education and English); Richard Brown, *Instructor* (Education and Mathematics); Harold Kilbreth, *Instructor* (Education and Science); Julius Margulies, *Instructor* (Education and History); Joyce Hanrahan, *Instructor* (Elementary Education); C. Paul Quimby, *Instructor* (Education).

William H. Annis, *Assistant Professor* (Agricultural-Education); George R. Thomas, *Professor* (Art-Education); Paul E. Schaefer, *Associate Professor* (Biology-Education); Lewis C. Goffe, *Associate Professor* (English-Education); William R. Jones, *Associate Professor* (History-Education); Marjory Wybourn, *Professor* (Home Economics-Education); Albert A. Bennett, *Assistant Professor* (Mathematics-Education); John B. Whitlock, *Associate Professor* (Music-Education); Thomas Barstow, *Assistant Professor* (Physical Education); Barbara Newman, *Associate Professor* (Physical Education); Isabel Irwin, *Instructor* (Spanish-Education); Ronald Lewis, *Instructor* (French-Education).

Cooperating Teachers: Patricia Abbott, Eleanor Adams, Paul Aldrich, Milton Allison, Iria Anderson, Gloria Andrade, Brenda Argerow, Priscilla Ayer, Blanche Bailey, Ernest Bainton, Albert Barbour, Irma Barbour, Leonard Barron, Rodney

Bascom, Paul Bevilacqua, Keith Bickford, Florence Blake, Betty Blatchford, Helen Blinn, Valerie Bloom, Penelope Boehringer, Hugo Bolin, Brian Brennan, Diane Brennan, Marion Brown, Mary Brown, Russell Brown, Martha Bstandig, Linda Buell, Janet Callahan, Patricia Cameron, Thomas Casey, James Cavanaugh, Mary Cavanaugh, Marguerite Chamberlain, Naomi Charest, William Childs, Nancy Cole, Dorothy Colprit, Mary Concannon, Florence Condron, Robert Cook, Judith Cooper, George Corrigan, Virginia Courtney, Judith Coutts, Sharon Cowen, Rose Cronk, Chris Crosier, John Cummings, Grace Cunningham, Pamela Dalhaus, Patricia Danforth, Daisy Day, Daniel Deshon, Diane Dittmar, Edward Dobe, John Dodds, Robert Dodge, Marie Donahue, Cassandra Donovan, Julie DuBois, Mary Echols, Robert Ellis, William Elwell, Florence Emerson, Sister Ernesta, Frederick Fernald, Harold Fernald, Edmund Flanagan, Caroline Foley, Jeffrey Franceour, Richard Gagliuso, Anne Gardella, Bert Gardner, John Getchell, Paul Gilman, Pauline Gilman, Emily Gourlie, Doris Grady, Ralph Granger, Marilyn Greene, Rodney Grondin, Donald Hackett, Paul Hamel, John Hazard, Lawrence Heath, Helen Hennesey, Barbara Hoffman, Beverly Hotaling, Harriet Hughes, Elizabeth Ireland, Ronald Jeffords, Priscilla Jenness, Joseph Kazura, Edith Kelley, Harold Kilbreth, Ruth Kimball, Sarkis Kirkjian, Sheila Knight, Edward Labbe, Alide Lavallee, Olive Lawrence, Ronald Lewis, Margaret Linton, Albert Mackie, George Mannix, Gerald Marks, Caroline Marr, Mary Metcalf, Jane Millette, Catherine Minehan, Arthur Mirabile, Benjamin Mooney, William Moore, Walter Morgan, Richard Moreau, Helen Murray, Genevieve Myers, Glenn Nelson, Philip Nelson, Stuart Norash, Roger Noyes, Barbara O'Dea, Eloise O'Donnell, Doris Palmer, Loleta Palmer, Lewis Parisi, Raymond Parkins, Richard Pecunies, Alfred Pellerin, Marjorie Perkins, Linda Perry, John Peterson, Martha Phillips, Charles Pillsbury, Robert Quinn, Carlos Rapp, Trevor Rea, Edward Renaud, Mary Robbins, James Robinson, Susan Rosefielde, Bernice Ruddy, Christine Rayn, Ellen Sanborn, William Sanders, Lolita Sargent, Lee Savramis, Aimee Schramm, Rosemary Scott, Neil Shapiro, Robert Sherak, Alfred St. Cyr, Sadie Stevens, Ronnie Strasbourg, Eleanor Swain, Joseph Tardy, Louise Temple, Anne Thayer, Martha Thyng, Mary Tighe, Ruth Trappan, Edmund Valade, Katherine Valentine, Doris J. Valley, Ralph Van Horn, Mildred Weeks, Jean Weiss, Sandra Wells, Audrey White, Virginia Whitlock, Edith Whittum, Judy Wild, Flora Wotton, Rosemary York, Judith Young, Diane Zeamba.

481. An Educational Psychology of Development

The philosophical and psychological principles underlying the process of education. Through a critical examination of human behavior, the student gains self-knowledge and an understanding of principles that affect all men. An analysis of popular novels, autobiographical reports, and technical studies constitute the basis for group thinking and discussion. The reading period will encourage "reading the self" through human encounter, creative action, disclosure, analysis, and self-restructuring. 4 credits.

610. Teaching Elementary School Language Arts

Investigation of the processes of oral and written language. Evaluation of abilities and individualizaton of instruction. Comparison of current procedures and materials for teaching listening, speaking, and writing. (Offered in Extension and Summer School only.) 4 credits.

611. Teaching Elementary School Social Studies

The objectives, content, methods, and materials for instructing elementary school children in the social studies. (Offered in Extension and Summer School only.) 4 credits.

612. Teaching Elementary School Mathematics
The objectives, context, methods, and materials for instructing elementary school children in mathematics. (Offered in Extension and Summer School only.) 4 credits.

613. Teaching Elementary School Science
Involvement strategies for elementary science instruction. Inquiry and discovery approaches will be compared with more conventional methods. Selection and justification of goals for science instruction will also be treated. A brief survey of resources available for science teachers, including analysis of current curriculum projects. (Offered in Extension and Summer School only.) 4 credits.

614. Teaching Elementary School Reading
Investigation of the reading process. Evaluation of abilities and individualization of instruction. Comparison of current procedures and materials for teaching reading. (Offered in Extension and Summer School only.) 4 credits.

657. Psychology of Human Learning
Analysis of the learner and the learning process based on theory and research in learning, personality, and social psychology, as a foundation for instructional theory, methodology, and technology. Concepts and processes will be illustrated and applied through discussion, simulation, observation, and laboratory experiences. 4 credits.

658. Principles of Teaching
Application of theories of learning studied in Education 657, with emphasis on process selection, content goals, organization of learning materials, planning learning experiences, and evaluation procedures. Prerequisite: Education 657. 4 credits.

659. Principles of Education
An introductory study of the major historical and sociological factors that have influenced public education in the United States, the conflicts of educational philosophy, and selected contemporary educational problems of national significance. Prerequisite: Education 658 and permission of the instructor. 4 credits.

691. Science Curriculum and Instruction
A course to introduce prospective secondary teachers of physics, chemistry, earth science, or general science to modern curricula and methods in the sciences. A survey of some of the contemporary programs of national interest in secondary school science. A variety of goals and methods for teaching science. Prerequisite: Education 658 or taken concurrently.

694. Courses in Supervised Teaching
See page 83 for description of secondary school teacher preparation program.
Supervised Teaching of Physical Education. 6 credits.
Supervised Teaching of Agriculture. 6 credits.
Supervised Teaching of Art. 6 credits.
Supervised Teaching of English. 6 credits.
Supervised Teaching of Social Studies. 6 credits.
Supervised Teaching of Home Economics. 6 credits.
Supervised Teaching of Foreign Language. 6 credits.
Supervised Teaching of Mathematics. 6 credits.
Supervised Teaching of Music. 6 credits.
Supervised Teaching of Sciences. 6 credits.

734. Children's Literature
A consideration of children's books and methods of using them, with emphasis given to intermediate grades. Practical demonstrations of how to correlate children's books with various special projects. 4 credits.

741-742. Elementary School Teacher Preparation
A block program, including observation; psychology of learning; principles of teaching reading, language arts, social studies, mathematics, science and other elementary school subjects; student teaching; and a synthesizing seminar. Prerequisite: permission of the Department. 16 credits per semester.

763. Instructional Media
To help improve ability to communicate ideas through materials and equipment commonly available in a school audio-visual center. Educational films, bulletin board design, the role of language labs, educational television, programmed learning, and media research. A laboratory period of one hour each week is required in addition to the regular class period. Prerequisite: Education 657. 4 credits.

764. School Library Materials and Services
Background and development of the school library, including functions, objectives, and standards. Relationship of library services to the curriculum, classroom teacher, and students, and to the public library. 4 credits.

765. Reference Materials in the School Library I
The selection and evaluation of basic reference materials common to all libraries. Introduction to school library informational and research techniques. Prerequisite: Education 764. 4 credits.

766. Technical Processes in the School Library I
Ordering, processing, and organizing school library materials. Special emphasis on classification and cataloguing systems. Prerequisite: Education 764. 4 credits.

767. Materials Selection for School Libraries
Techniques for building the school library collection in all subjects. Analysis of books for children and young people. Practice in compilation of bibliographies for selected levels and interests. Prerequisite: Education 764 and 765. 4 credits.

785. Educational Tests and Measurements
An introduction to the theory and practice of educational evaluation. Emphasis given to uses of test results in classroom teaching and student counseling. Introductory statistical techniques. Prerequisite: Education 657. 4 credits.

795, 796. Independent Study
Open to juniors and seniors only. Must be approved by appropriate faculty member. 4 credits.

Electrical Engineering (83)

Joseph B. Murdoch, *Professor and Chairman;* Leon W. Hitchcock, *Professor Emeritus;* Alden L. Winn, *Professor;* Robert N. Faiman, *Professor;* John B. Hraba, *Professor;* Albert D. Frost, *Professor;* Fletcher A. Blanchard, *Professor;* Kerwin C. Stotz, *Associate Professor;* Donald W. Melvin, *Associate Professor;* Ronald R. Clark, *Associate Professor;* H. Richard Skutt, *Associate Professor;* Robert W. Goodrich, *Assistant Professor;* Filson H. Glanz, *Assistant Professor;* Glen C. Gerhard, *Assistant Professor;* John L. Pokoski, *Assistant Professor;* Harold F. Wochholz, *Assistant Professor*

402. Introduction to Engineering Design
Discussion of the history and development of the engineering profession. The process of analyzing and formulating solutions to engineering problems. Case studies in engineering. Introduction to analog and digital computation. Engineering communications. Prerequisites: Mathematics 425 and Physics 407. Required of electrical engineering freshmen.

Open to others. 3 seminars, 1 laboratory, 4 credits.

501. Dynamic Linear Systems I
502. Dynamic Linear Systems II
Dynamics of electrical and mechanical linear systems, mathematical modeling, linear system transient and steady-state analysis, Laplace transforms and convolution, Fourier series and spectra. Prerequisites: Mathematics 426 and Physics 408. 2 lectures, 2 recitations, 4 credits.

503. Electrical Circuit Theory
Generalized network analysis, coupled circuits, one- and two-port networks, three-phase systems, elementary synthesis, filter properties, analysis of interconnected passive networks, steady-state and transient analysis of distributed parameter networks. Prerequiste: Electrical Engineering 502. 4 credits.

505. Electronic Properties of Materials and Devices
The nature of the electron, duality, single crystals, energy levels, and band theory. Electronic transport properties of semiconductors and metals, dielectric and magnetic properties, semiconductor PN junctions. Prerequisites: Physics 408, Chemistry 405, and Mathematics 527; Electrical Engineering taken concurrently. 4 recitations, 4 credits.

509. Electromagnetic Fields
Static and dynamic electric, magnetic and electromagnetic fields. Maxwell's equations, wave equations, plane waves. Prerequisites: Mathematics 527, Mathematics 528, Physics 408. 4 recitations, 4 credits.

510. Linear Electronic Circuits
Theory of operation, analysis, and design of active circuits containing electronic devices. Prerequisite: Electrical Engineering 505. 4 credits.

515-516. Systems Laboratory I and II
Introductory experiments with electrical and electro-mechanical systems. To be taken concurrently with Electrical Engineering 501, 502. 1 credit each.

517. Electrical Laboratory I
Operation and application of instruments used in electrical engineering. Prerequisite: Electrical Engineering 503 taken concurrently and Electrical Engineering 516. 1 laboratory, 1 credit.

518. Electrical Laboratory II
Experimental investigations in the principles of electrical engineering as applied to electrical devices and systems. Prerequisite: Electrical Engineering 510, 520 taken concurrently and Electrical Engineering 517. 2 lectures, 2 laboratories, 4 credits.

520. Electromechanical Energy Conversion
Theory and analysis of transformers and electromechanical energy converters. Prerequisites: Electrical Engineering 502 and 509. 4 credits.

522. Electrical Laboratory for Mechanical Engineers
This course is an electronic laboratory designed for those mechanical engineering students who elect Electrical Engineering 510. Prerequisite: Electrical Engineering 510 taken concurrently. 1 laboratory, 1 credit.

533. Fundamentals of Electrical Engineering
Direct and alternating current circuits. This course is designed for non-electrical engineering majors. 2 recitations, 2 credits.

535. Electrical Engineering Fundamentals
Selected topics in network analysis and an introduction to electronic devices and circuits. This course is designed for non-electrical engineering majors. Prerequisite: Electrical Engineering 501-502. 4 recitations, 4 credits.

611. Nonlinear Electronic Circuits
Active electronic non-linear circuits in the switching mode. Treats analysis and design of both discrete component and integrated circuits. Use is made of ECAP transient analysis computer programming.

Prerequisite: Electrical Engineering 510. 3 lectures, 1 laboratory, 4 credits.

620. Electronics and Instrumentation
A service course for those students not in engineering or physics. No attempt is made to cover the topics in mathematical or engineering detail. Emphasis is placed on making the student aware of problems which he is most likely to encounter when using electronic equipment. Proper technique for using electronic instruments is pointed out in classroom demonstrations and laboratory experiments. Topics covered include D.C. and A.C. circuits, electronic amplifiers, grounding and shielding problems, transducers, electronic instruments, schematic reading, transients, noise problems, and digital techniques. No prerequisites except junior standing. 3 recitations, 1 laboratory, 4 credits.

641. Electronic Fundamentals
Physical electronics, electronic circuits with emphasis on instrumentation. Prerequisite: Electrical Engineering 533. 3 recitations, 1 laboratory, 4 credits.

695. Electrical Engineering Projects
A laboratory or advanced study course. Each student will either join one of the department research projects or engage in a project which is in one of the areas of current staff interest. Admission to the course will be limited to those accepted by a staff member. 1-4 conferences or 1-2 laboratories, variable credit.

706. Advanced Circuit Theory
Advanced topics in the analysis and design of electrical networks. Topics will be chosen from the areas of linear graph theory, matrix and state variable representations, approximation and filter design, distributed networks, Laplace and Fourier transform analysis, passive and active network synthesis. Permission of instructor. 4 credits.

711. Digital Systems
Generalized, systematic, and practical approach to the logical design of digital systems encompassing circuit components, binary arithmetic, boolean algebra, simplification methods and derivation of application and input equations in accordance with current digital system strategies. Practical combinatorial circuits and logical arrays are emphasized in both synchronous and asynchronous applications. Logical equivalents are formulated together with the system aspects of interfacing digital communication systems, wiring and reliability considerations. Prerequisite: senior status or above within the College of Technology or approval of the instructor. 3 lectures, 1 laboratory, 4 credits.

712. Logical Design of Digital Computers
Extension of Electrical Engineering 711 to the design of both general and special purpose digital computers. The design parameters of input-output, memory, peripheral arithmetic and control units are established together with complete design equations for representative digital computers. Analog and hybrid methods are presented together with error free techniques, and a survey of research trends applicable to present and next generation computers. Prerequisite: Electrical. Engineering 711 or approval of instructor. 3 lectures, 1 laboratory, 4 credits.

725. Advanced Analysis of Machinery
Theory and analysis of electromechanical energy converters with emphasis on the effect of the machine parameters on its static and dynamic performance. Prerequisite: Electrical Engineering 520 or permission of instructor. 1 laboratory, 3 recitations, 4 credits.

727. Power Systems
An introduction to the modeling and planning of electric power transmission systems. Prerequisite: Electrical Engineering 503. 4 credits.

741. Fundamentals of Acoustics
The development of the acoustical wave equation for gases, solids and liquids;

reflection, refraction and absorption; characteristics of acoustic sources; acoustical measurements; architectural acoustics; industrial noise control. Prerequisite: Physics 408, Mathematics 527, 528. 4 credits.

757. Communication Theory
Introduction to information theory; Fourier analysis, continuous and pulse modulation, sampling, quantization; noise in electrical circuits. Prerequisite: Electrical Engineering 503, 510. 4 credits.

758. Communication Systems
Application of communication theory and electronics to high frequency communication systems. Modulators, R. F. amplification, receivers, antennas, free-space propagation, ionospheric properties. Prerequisite: Electrical Engineering 509, 517, 757, or equivalent. 3 recitations, 1 laboratory, 4 credits.

762. Illumination
Radiation, fundamental processes in gases, sources of visible and near-visible energy, light measurement and control, color and the eye, illumination design, lighting applications. Permission of instructor. One 2-hour seminar, 2 credits.

770. Integrated Circuit Design and Technology
An introduction to the principles of operation, design, processing, and technology of linear and non-linear integrated circuits. Bipolar and unipolar structures, including surface-controlled devices, will be considered. Related topics will include thin-film hybrid circuit techniques, vacuum technology, opto-electronic devices, and microwave active circuits. Prerequisite: Electrical Engineering 505, 510, and 611. 2 recitations, 1 laboratory, 4 credits.

780. Engineering Analysis
The basic principles and analytical methods employed in the solution of complex problems in the various branches of engineering. Prerequisite: Permission of instructor. 4 credits.

781. Instrumentation
Analysis and design of instrumentation systems, sensors, circuits and devices for electrical measurements and control, techniques of sampled data, telemetry, display, storage, and processing of information. Prerequisite: senior standing. 3 recitations, 1 laboratory, 4 credits.

782. Control Systems
Fundamental principles involved in the design and analysis of feedback control. Topics include stability criterion, time domain analysis, frequency domain analysis, and introduction to non-linear systems. Prerequisite: Electrical Engineering 503, 520, or permission of instructor. 3 recitations, 1 laboratory, 4 credits.

796. Special Topics in Electrical Engineering
New or specialized courses are presented under this listing, on sufficient demand. Independent study can be given under this course title. Prerequisite: permission of instructor. Variable credit. Laboratory projects are not given under this course number. See Electrical Engineering 695 or 898.

English (49)

John C. Richardson, *Associate Professor and Chairman;* Sylvester H. Bingham, *Professor;* Robert G. Webster, *Professor;* Dale S. Underwood, *Professor;* G. Harris Daggett, *Professor;* Thomas A. Williams, *Professor;* Donald M. Murray, *Professor;* William B. Hunter, *Professor;* Robert D. Hapgood, *Professor;* Max S. Maynard, *Associate Professor;* Lewis C. Goffe, *Associate Professor;* Edmund G. Miller, *Associate Professor;* Philip L. Nicoloff, *Associate Professor;* John A. Yount, *Associate Professor;* Thomas A. Carnicelli, *Associate Professor;* Hugh M. Potter, III, *Assistant Professor;* Mark R. Smith, *Assistant Professor;* Terence P. Logan, *Assistant Professor;* S. Anthony Caldwell,

Assistant Professor; Theodore M. Weesner, *Assistant Professor;* James T. Sullivan, *Instructor;* Hidde H. Van Ameyden van Duym, *Instructor;* Julian H. Smith, III, *Instructor;* David V. Siddall, *Instructor;* Edward J. Hanrahan, *Instructor;* Helen Hollingsworth, *Instructor;* Penelope Van Ameyden van Duym, *Instructor;* Royce E. Burton, *Instructor;* Richard L. Pevear, *Instructor;* Nancy H. Deane, *Instructor;* Doris M. Schoenhoff, *Instructor;* Christopher D. MacLeod, *Instructor;* Robert L. Fried, *Instructor;* Donna L. Chitwood, *Instructor;* Lester A. Fisher, *Instructor;* Joyce W. Cohen, *Instructor*

301. Improvement in Writing*
Required of all students whose attainments in the fundamentals of English are found to be unsatisfactory. 3 recitations, no credit, NLG.

302. Improvement in Reading*
Intensive drill in reading skills for six weeks. 3 recitations, no credit, NLG.

303. English as a Second Language
For students to whom English is a foreign language, a course of instruction in speaking, reading, and writing. Mr. van Ameyden van Duym and Mr. Frederick Murray. No credit, NLG.

401 (401). Freshman English
Training to write more correctly and with more force and to read with more appreciation and discernment. The staff of the department under the direction of Mrs. Deane. 4 credits.

402 (402). Freshman Seminars — Approaches to Literature
Intensive study of a specific literary topic, a theme, a genre, a major figure, or a specific period of English or American literature. 4 credits.

501 (501). Expository Writing
The discipline of non-fiction writing. Weekly papers and frequent conferences required. Prerequisites: English 401. 4 credits.

513, 514. A Survey of English Literature
513: From the Old English period to 1800. 514: From 1800 to the present. Prerequisite: English 401. 4 credits.

515, 516. A Survey of American Literature
515: From the beginning of American literature to Whitman. 516: From Whitman to the present. Prerequisite: English 401. 4 credits.

517. An Introduction to Literary Genres
An introduction to literary forms, either traditional (such as lyric, epic, comedy, and tragedy) or modern (such as the novel and short story). The genres studied and their number vary from year to year. Prerequisite: English 401. 4 credits.

518. The Bible as Literature
The various literary types found in the Bible and a survey of the influence of the Bible on English literature. Prerequisite: English 401. 4 credits. (Not offered in 1969-70.)

519. Introduction to Critical Analysis
An examination of literature apart from the historical context. Works vary from year to year. Prerequisite: English 401. 4 credits.

520. Literature and the History of Ideas
An interdisciplinary study of literary works as influenced and illuminated by the concepts of philosophers, historians, and scientists. Prerequisite: English 401. 4 credits.

523. Writing of Technical Reports
Mr. Webster. 2 credits.

* Any student may be recalled and reassigned to an instruction group at any time in his four years of college upon report of any member of the faculty that his work in composition or in reading is deficient.

621-622. Non-Fiction Writing
A workshop course in the writing of non-fiction. Students interested in journalism will be able to practice writing under strict limitations of time and space in this course, which will prepare them for a career in journalism. Other students will be able to practice forms of non-fiction writing in which they are interested. Individual conferences. Mr. Murray. 4 credits. No prerequisite except *permission of instructor. May be repeated for credit with approval of the department chairman.*

625-626. Writing Fiction and Poetry
A workshop in the fundamental techniques of fiction and poetry. Individual conferences. Mr. Yount, Mr. Smith, and Mr. Weesner. Prerequisite: English 401. 4 credits. *May be repeated for credit with the approval of the department chairman. Written permission of instructor required for registration.*

651, 652. Comparative World Literature
A comparison of two or more national literatures through movements, genres, motifs, and dominant philosophic and artistic ideas. 4 credits.

695, 696. Senior Honors
Open to senior English majors who, in the opinion of the department, have demonstrated the capacity to do superior work in English. In the first semester the student will examine a series of special literary problems and write a number of short papers. In the second semester, he will investigate independently one or two larger topics and write one or two long papers. Mr. Miller. 4 credits. *Open to seniors by departmental invitation only.* May be counted as two courses toward the eight which constitute a major in English.

697, 698. Senior Seminars
Intensive study of specialized topics which vary from year to year. Enrollment in each seminar limited to 15 students. 4 credits. *Permission of instructor required. Exceptional juniors may be admitted with permission of instructor and department chairman.*

701-702. Advanced Writing of Fiction and Poetry
Workshop discussions of advanced writing problems and readings of students' fiction, poetry, or plays. Individual conferences. Mr. Williams. Prerequisite: English 625-626 or its equivalent. 4 credits. *May be repeated for credit with the approval of the department chairman. Written permission of instructor required for registration.*

703-704. Advanced Non-Fiction Writing
A workshop course for advanced students of writing. The course provides a second year of training for those interested in journalism, but it also provides an opportunity for students to practice other forms of non-fiction writing. Individual conferences. Mr. Murray. 4 credits. No prerequisite except *permission of instructor. May be repeated for credit with the approval of the department chairman.*

705. English Grammar
A review of English grammar including both traditional and contemporary approaches. Mr. Goffe. 4 credits. (Not offered in 1969-70.)

706. English Linguistics
A descriptive approach to modern English grammar, emphasizing the insights provided by linguistic analysis. Mr. Hunter. 4 credits.

709, 710. Critical Analysis of Exposition and Fiction
709, exposition; 710, fiction. Mr. Bingham. 4 credits.

711. Critical Analysis of Poetry and Drama
A non-historical, non-genre approach to individual poems and plays with emphasis on the works themselves. Mr. Richardson. 4 credits.

713, 714. Literary Criticism
Major critics from Plato to the present and the chief critical approaches to literature. 4 credits. (Not offered in 1969-70.)

742. Puritanism and the Enlightenment in America
American literature and thought from the colonial beginnings through the early republic. 4 credits.

743. American Transcendentalists
Emerson, Thoreau, and other transcendentalists. (Formerly English 775). Mr. Daggett. 4 credits. (Not offered in 1969-70.)

744. American Fiction to the Civil War
Cooper, Poe, Hawthorne, Melville, and others. (Formerly English 776). Mr. Goffe. 4 credits.

745. American Poetry of the Nineteenth Century
Bryant, Poe, Emerson, Whitman, Dickinson, and others. (Formerly English 777.) Mr. Daggett. 4 credits.

746. American Realism and Naturalism
Twain, James, Adams, Stephen Crane, Dreiser, and others. 4 credits.

747, 748. American Fiction and Drama of the Twentieth Century
Fitzgerald, Hemingway, O'Neill, Faulkner, and others. (Formerly English 779, 780.) Mr. Nicoloff and Mr. Potter. 4 credits.

749. American Poetry of the Twentieth Century
Robinson, Frost, Stevens, Pound, Eliot, Jeffers, Hart Crane, Robert Lowell, and others. Mr. Nicoloff. 4 credits.

751. History of the English Language
A study of the evolution of the English language, with special emphasis upon the relation between linguistic change and literary style. Mr. Carnicelli. 4 credits.

753. Old English
An introduction to Old English language and literature through readings of selected poetry and prose. Mr. Carnicelli. 4 credits. (Not offered in 1969-70.)

754. Beowulf
A reading of the poem and an introduction to the scholarship. Mr. Carnicelli. Prerequisite: English 753. 4 credits. (Not offered in 1969-70.)

755, 756. Chaucer
755: Chaucer's allegorical poems and *Troilus and Criseyde*. 756: *The Canterbury Tales*. Mr. Underwood. 4 credits. (Not offered in 1969-70.)

757-758. Shakespeare
757 surveys a number of representative plays from throughout Shakespeare's career; 758 studies a few plays more intensively. Mr. Hapgood and Mr. Hunter. 4 credits.

759. Milton
Milton's life and times, all his poetry, and a selection of his prose. Mr. Hunter. 4 credits. (Not offered in 1969-70.)

763, 764. English Literature in the Sixteenth Century
763: Major literary figures of the continental Renaissance (in translation), including Petrarch, Machiavelli, Ariosto, Rabelais, Montaigne, Cervantes, and Erasmus; major English writers of the period, including More, Skelton, Wyatt, and Surrey. 764: Sidney, Drayton, and other late Elizabethans, with emphasis upon Spenser. Mr. Logan. 4 credits.

765, 766. English Literature in the Seventeenth Century
765: Major writers of prose and poetry in the first half of the century; special emphasis upon the relationships between the "metaphysical" and the "classical" modes of poetry. 766: Restoration comedy of manners, heroic drama, verse satire, Dryden, Milton, and Bunyan. Mr. Underwood. 4 credits.

767, 768. English Literature in the Eighteenth Century
767: Addison, Steele, Defoe, Pope, and Swift. 768: Gray, Collins, the Wartons, Burke, Goldsmith, Reynolds, Johnson Boswell, Crabbe, Burns, and Blake. Mr. Maynard. 4 credits.

769. The English Romantic Period
Wordsworth, Coleridge, Lamb, Hazlitt, DeQuincey, Byron, Shelley, and Keats. Mr. Miller. 4 credits.

771, 772. Victorian Prose and Poetry
771: Carlyle, Mill, Ruskin, Newman, Tennyson, and Browning. 772: Arnold, Clough, the Pre-Raphaelites, Swinburne, Hopkins, Hardy, Housman, and others. Mr. Miller. 4 credits. (Not offered in 1969-70.)

773, 774. British Literature of the Twentieth Century
773: Shaw, Conrad, Joyce, Yeats, and others. 774: Huxley, Lawrence, Eliot, Auden, Dylan Thomas, and others. Mr. Daggett and Mr. Richardson. 4 credits.

781, 782. Introduction to English Drama
The development of English drama, exclusive of Shakespeare, from the Middle Ages to the present. 781: From the Middle Ages to the closing of the theatres in 1642. 782: From the Restoration to the present. Mr. Caldwell. 4 credits.

783. The English Novel of the Eighteenth Century
4 credits. (Not offered in 1969-70.)

784. The English Novel of the Nineteenth Century
One representative novel of each of the following: Jane Austen, Scott, Dickens, Thackeray, Emily Bronte, Charlotte Bronte, Trollope, George Eliot, and Hardy. Mr. Miller. 4 credits.

English Education 791. Problems in the Teaching of High School English
Principles and methods of teaching literature, composition, and language in secondary schools. Required of all students in the English teaching major. Open to English majors with permission of the instructor. Mr. Goffe. 4 credits. *No credit toward the English major.*

795, 796. Independent Study
Individual guided study in special topics. Open to highly qualified juniors and seniors both semesters but for a *maximum of 4 credits.* To be elected only with permission of the department chairman and of the supervising faculty member or members. *Not open to graduate students.*

797, 798. Special Studies in Literature
The precise topics and methods of each section will vary. 4 credits. *No more than 2 courses may be counted toward the minimum of 5 courses in literature required for the English major.*

1. Old English Literature
2. Medieval Literature
3. The Renaissance
4. The Seventeenth Century
5. The Eighteenth Century
6. The English Romantic Period
7. The Victorian Period
8. The Twentieth Century
9. The Drama
10. The Novel
11. Poetry
12. Non-Fiction
13. American Literature
14. A Literary Problem

Entomology (29)

James G. Conklin, *Professor and Chairman*; Walter C. O'Kane, *Professor Emeritus*; Robert L. Blickle, *Professor*; R. Marcel Reeves, *Assistant Professor*

(402), 402. Introductory Entomology
An introduction to entomology in its broad aspects. The structure, biology, and classification of insects. This course is adapted to students contemplating a ma-

jor in entomology, in wildlife management, or in the fields of biology or biology-education. Each student is required to make an insect collection. Open to any student. Mr. Conklin. 3 lectures, 1 laboratory, 4 credits.

503. Principles of Economic Entomology
The nature of insect damage. The methods of insect control. Quarantine and regulatory measures. Natural control. Applied control measures. Open to any student. 3 lectures, 1 laboratory, 4 credits.

506. Forest Entomology
Structure and development of insects. Orders and families of insects of importance to foresters. Principals of insect control. Biology and control of representative forest insects. Each student is required to make an insect collection. Adapted especially for forestry majors. Open to any student. Mr. Conklin. 3 lectures, 1 laboratory, 4 credits.

704. Medical Entomology
Insects and arachnids in relation to public health. The more important disease carriers, their biologies, and means of control. Adapted especially for students interested in public health or medicine. Mr. Blickle. Elective for juniors and seniors. 2 lectures, 1 laboratory, 4 credits.

707, 708. Advanced Entomology
Insect anatomy, insect ecology and systematic entomology. Required of entomology majors. Open to others by permission of the instructor. Mr. Blickle, Mr. Conklin. 2 lectures, 1 4-hour laboratory, 4 credits. R 1. Taxonomy; R 2. Morphology; R 3. Aquatic Insects; R 4. Insect Physiology.

709, 710. Advanced Economic Entomology
Studies in the specialized phases of entomology. This course is structured to meet the objectives of the individual student. Mr. Conklin, Mr. Blickle. Required of entomology majors. Open to others by permission of the instructor. Hours to be arranged. 2 or 4 credits. R 1. Agricultural entomology; R 2. Biological Control of Insects; R 3. Chemical Control of Insects; R 4. Regulatory Entomology; R 5. Structural Pest Control.

Forest Resources (30)

Otis F. Hall, *Professor and Chairman;* Clark L. Stevens, *Professor Emeritus;* Paul E. Bruns, *Professor;* Oliver P. Wallace, *Associate Professor;* Harold W. Hocker, Jr., *Associate Professor;* John L. Hill, *Associate Professor;* David P. Olson, *Associate Professor;* Roger P. Sloan, *Assistant Professor;* Bennett B. Foster, *Assistant Professor;* Richard R. Weyrick, *Assistant Professor;* R. Marcel Reeves, *Assistant Professor;* Ernst J. Schreiner, *Adjunct Professor;* Robert S. Pierce, *Adjunct Associate Professor;* William B. Leak, *Adjunct Assistant Professor*

425. Dendrology
The identification, classification, and silvical characteristics of trees and shrubs in autumn and winter. An introduction to plant taxonomy, ecological succession, soils, and plant geography. The principal forest regions of North America: their location, extent, climatic conditions, and important timber species. Required of freshmen in forestry. Elective for others. Staff. 2 lectures, 2 laboratories, 4 credits.

426. Wood Technology
An introduction to the fundamental properties of wood, including macro- and microstructure, physical, chemical, and mechanical properties. Introduction to seasoning and preservation of wood. Identification of commercially important timbers. Prerequisite: Forest Resources 425 or permission of instructor. Mr. Hill. 2 lectures, 2 laboratories, 4 credits.

527. Silvics
The ecological basis of silviculture. Classification of forest communities; environmental factors and their influence

on forest vegetation; influence of vegetation on environment. Mr. Hocker. Prerequisite: Botany 411, Forest Resources 425 or Botany 506, Soil and Water Science 501 taken concurrently. 3 lectures, 1 laboratory, 4 credits.

528. Applied Statistics I
Development of elementary statistical techniques through the analysis of prepared data. Topics reviewed include numeric scales; continuous and discreet probability distributions; distributions of sample statistics; small sample theory; elementary analysis of variance, regression, correlation, their non-parametric analogues and chi-squares. Attention is paid to the use of available computer programs in the numerical solutions to statistical problems. Mr. Durgin. 4 credits.

542. Forestland Surveying
The use of common forest surveying equipment and techniques. Course to include use and preparation of maps with various types of equipment and methods, public land survey, and courthouse search for deeds and surveys. Mr. Foster. Two-week field session in June. 2 credits.

544. Forest Economics
Principles of economics as applied to the past, present, and future supply and demand situation for forest products and services. Forestry and the general economy. Economics of the firm. Elements of forest valuation. Forest taxation. Mr. Foster. Prerequisite: a course in the principles of economics. 4 credits.

629. Silviculture
The theory and techniques of applying ecological knowledge to the control of establishment, composition, and growth of forest stands for economic purposes. Field practice including marking of stands for various kinds of cutting and for cultural treatment. Mr. Hocker. Prerequisite: Forest Resources 425 and 527. 2 lectures, 2 laboratories, 4 credits.

634. Wildlife Ecology
The biological principles and human factors affecting wildlife and fish populations, and an introduction to the theory and practice of wildlife management. Includes a survey of common fish and wildlife species, research problems, and management techniques. Mr. Olson. Prerequisite: a basic course in biology, botany, zoology, or consent of instructor. 2 lectures, recitation, laboratory, 4 credits.

635. Contemporary Conservation Issues
Man's technology applied to the wildland renewable resources causes biological and social conflicts because men's objectives relative to these resources differ. Game, timber, water, minerals, and soil are major sources of economic growth but conflicts between use and preservation must be continually resolved. Elective for all students except freshmen and forestry majors. Mr. Wallace. Staff. 4 credits.

643. Forest Biometrics
Application of mathematical, statistical, and computer techniques in forest resource measurements and inventory. Course includes area sampling, point sampling, and photogrammetric techniques. The least-squares approach is used in sampling and in deriving volume and biological growth equations. Prerequisite: calculus, computer techniques, and spring field session. Mr. Barrett. 2 1½-hour seminars, 1 laboratory, 4 credits.

660. Forest Fire Protection
Principles and techniques of forest fire prevention, predicting fire behavior, and effective forest fire control. Weather phenomena related to fire occurrence and behavior. Fire effects and determination of damage. Fire as a part of forest management activity. Mr. Weyrick. Prerequisite: Forest Resources 527 or 629, Soil and Water 501. 2 lectures, 1 laboratory, 10 weeks of semester, 2 credits.

695, 696. Investigations in Forestry
Work to be arranged according to the needs of individual students. Staff. Prerequisite: permission of instructor. Hours to be arranged. 2 or 4 credits. 1. Forest

Ecology; 2. Photogrammetry; 3. Forest Utilization; 4. Game Management; 5. Mensuration; 6. Forest Economics; 7. Forest Management; 8. Operations Control and Analysis; 9. Recreation.

702. Natural Resources Policy
Contemporary issues in the management and allocation of natural resources. The impact of human activity and demands on resources, including agricultural and forest lands, water, wildlife, fisheries, and minerals. Historical perspective as it contributes to an understanding of current public and private resource policies. Mr. Bruns, Mr. Weyrick, Mr. Bowring, Mr. Drew. Prerequisite: permission of instructor. 4 credits.

711. Statistical Methods II
An intermediate course in statistics. Topics include basic concepts of sampling, linear models and analyses for one-way and multiway classifications, factorial arrangement of treatments; multiple regression, and covariance. Mr. Barrett. Prerequisite: elementary statistics. Two 1½-hour seminars, 1 laboratory, 4 credits.

712. Sampling Techniques
A study of the techniques of sampling a finite population. Topics include choice of sampling unit and frame, estimation of sample size, confidence limits, and comparisons of sample designs. Mr. Barrett. Prerequisite: elementary statistics. 2 1½-hour seminars, 1 laboratory, 4 credits.

720. Forest Tree Improvement
The genetics of forest tree improvement with emphasis on variation in natural populations, the basis for selection of desired characters, and the fundamental of controlled breeding. The application of principles will be directed toward silviculture, management, and utilization. Mr. Hocker. Prerequisite: permission of instructor. 3 lectures, 1 laboratory, 4 credits. (Alternate years; offered in 1969-70.)

737. Game Management I
Biological characteristics, habitat usage, research, and management techniques of upland game birds and big game mammals. Students should be prepared for weekend field trips to wildlife areas in New England. Mr. Olson. Prerequisite: wildlife management major or consent. 2 lectures, 1 recitation, 1 laboratory, 4 credits.

738. Game Management II
Biological characteristics, habitat usage, research and management techniques of small game mammals, furbearers, and waterfowl. Students should be prepared for weekend field trips to wildlife areas in New England. Mr. Olson. Prerequisite: wildlife management major or consent. 2 lectures, 1 recitation, 1 laboratory, 4 credits.

745. Forest Management
Production control in forests with many uses and management objectives. Analysis of silvicultural, economic, and business problems. Practice of forest administration. Professional responsibilities and opportunities. Mr. Weyrick and Mr. Bruns. Prerequisite: completion of junior year in forestry curriculum. 3 lectures, 1 laboratory, 4 credits.

753. Operations Control and Analysis
Applications of economic principles to the control and analysis of harvesting and other field-based forest operations. The use of quantitative methods in developing cost functions, mathematical programming, game theory, simulation, and scheduling problems. Mr. Foster. Prerequisite: forest biometrics and forest economics. 4 credits.

754. Wood Products Manufacture and Marketing
A study of the wood products manufacturing industry from the harvesting and procurement of raw material to finished product processes with emphasis on management decisions, marketing and promotion problems. Visits to harvesting oper-

ations and manufacturing plants in the New England region are used as the basis for study. Mr. Hill. Prerequisite: Forest Resources 426 and 753. 3 lectures, 1 laboratory, 4 credits.

758. Photogrammetry in Forestry
Elementary principles of photogrammetry with emphasis on their application to land management. The value and use of aerial photos in forest typing; planimetric and topographic mapping; measurement of area and volume estimation. Mr. Bruns, Mr. Barrett. Prerequisite: permission of instructor. 2 lectures, 2 laboratories, 4 credits.

764. Forest Industry Economics
Application of business methods and economics in the establishment and operation of forest industries; planning for minimum cost operations and the profitable use of capital in forest enterprises. Mr. Wallace. Prerequisite: senior standing and permission of instructor. 2 1½-hour lectures, 1 laboratory.

797. Forest Recreation Seminar
The recreational use of forest lands, including factors that affect demand and supply for recreation. Planning for state and local recreational use, emphasizing the economic and social aspects. Mr. Wallace. Prerequisite: junior standing and permission of instructor. Two 1½-hour sessions, 4 credits.

798. Forest Resources Management Seminar
Population trends and human needs in relation to forest land productivity for timber, wildlife, water, recreation, and grazing. Organized groups involved in forest land use and management, and overall planning to help maximize forest land use and productivity for our society. Mr. Wallace. Prerequisite: Forest Resources 661. 4 credits.

French and Italian

Louis J. Hudon, *Professor and Chairman;* Clifford S. Parker, *Professor Emeritus;* Samuel E. Stokes, Jr., *Associate Professor;* Edna S. Hudon, *Visiting Associate Professor;* Grover E. Marshall, *Assistant Professor;* Margaret J. Sullivan, *Assistant Professor;* Bernard Faudon, *Visiting Assistant Professor;* Ronald W. Lewis, *Adjunct Instructor*

French (56)

New students will be assigned to proper courses on the basis of their scores on the College Board Achievement test. All courses are conducted in French. Papers are written in French unless otherwise noted. Non-majors may write papers and examinations in English in courses numbered 700 and above. French 605-606 is the first course counting toward a major. Students who studied French in grammar school may not take French 401-402. Students educated in French-speaking countries may not register for courses below the 700 level.

400. French for Reading Knowledge
For seniors and graduate students without a previous knowledge of French. The course is limited to reading and is designed for students going on toward a Ph.D. The course does not satisfy the Liberal Arts language requirement. 4 recitations, 4 credits.

401-402. Elementary French
For students without a previous knowledge of French. Development of basic skills in aural comprehension, speaking, writing, reading. 4 recitations, 1 practice drill, 2 laboratories, 4 credits.

503-504. Intermediate French
Intensive reading of complete texts of intrinsic literary and intellectual worth, formal review of grammar, training in oral and written expression of ideas. (Credit toward a minor. Open to freshmen.) 4 credits.

505-506. Introduction to French Literature and Thought
Reading and analysis of significant works in French Literature. The term paper is in English. Credit toward a minor. Open to freshmen. Not open to students who have had French 503-504.) 3 recitations, 4 credits.

514. French Grammar and Speech
Thorough review of grammar and practice in oral and written expression. Prerequisite: French 504 or 506. 3 recitations, 4 credits.

603-604. French Literature in Translation
This course is designed to present outstanding works of French literature in translation to students who have satisfied the language requirement in another language. Texts will vary from year to year. Certain periods will be covered by professors whose specialty is involved. Not open to freshmen. 3 recitations, 4 credits.

605-606. Readings in French Literature
Intensive readings in French literature from the Middle Ages to the present day. Outside readings on the historical and cultural background of the works read. This course is intended primarily for sophomores. It will treat works and periods not covered in French 503-504 or French 505-506. Open to students who have received a grade of C or better in French 504 or 506. Required of majors. 3 recitations, 4 credits.

685-686. Junior Year at Dijon University
A program of studies at the University of Dijon (France) for juniors who have completed their sophomore year at the University of New Hampshire and have passed with a grade of B or better French 605-606 and French 514. Students interested in the program are expected to take courses in French in both their freshman and sophomore years. The students chosen for the program will be required to take a non-credit orientation course during the second semester of their sophomore year. Interested students should consult with the director of the program, Professor Louis J. Hudon. 32 credits. Not offered for graduate credit.

741. French Literature of the Middle Ages
Readings in the epic, lyric poetry, and the romance. Prerequisite: French 606. 4 credits. (Alternate years; not offered in 1969-70.)

742. French Literature of the Renaissance
Readings in the literature of the Sixteenth Century. Prerequisite: French 606. 4 credits. (Alternate years; not offered in 1969-70.)

759-760. French Literature of the Seventeenth Century
Readings in the literature of the Seventeenth Century. Prerequisite: French 606. 4 credits. (Alternate years; offered in 1969-70.)

761-762. Eighteenth Century French Literature and Thought
Readings in the Age of Enlightenment and belles lettres of the period. Prerequisite: French 606. 4 credits. (Alternate years; not offered in 1969-70.)

767-768. Nineteenth Century French Literature
Readings in Romantic, Parnassian, and Realistic literature of the century. Prerequisite: French 606. 4 credits. (Alternate years; offered 1969-70.)

770. Introduction to Modern French Poetry
Studies in French Poetry from Baudelaire to the present. Prerequisite: French 606. 4 credits (Alternate years; offered in 1969-70.)

781-782. Contemporary French Novel and Theater
Readings in the French novel and theater of the Twentieth Century. Prerequisite:

French 606. 4 credits. (Alternate years; not offered in 1969-70.)

790. Advanced Language and Style
Translation of literary texts, intensive study of the principal techniques of style, *explication de textes.* Open to qualified students who have had a minimum of two courses in French numbered 741 and above. 4 credits.

791. Problems of Teaching French
Teaching methods, materials, devices, and an introduction to linguistics as applied specifically to the problems of teaching French. Examination of the goals and organization of French programs in American schools. Observation of classes in the local school system. For prospective teachers of French at pre-college levels. 4 credits. *No credit towards a major.* Prerequisite: French 605-606 and 514 or its equivalent.

795, 796. Special Studies in French Language and Literature
Individual guided study in special topics, with training in bibliography and organization of material. Examples of topics which may be selected are: the work of a major French author, specific topics in any area of French literature. Staff. Prerequisite: permission of the department chairman. 2 or 4 credits.

798. Seminar in French Literature
A study of French authors chosen by the instructor. Prerequisite: French 606. 4 credits. (Alternate years; offered in 1969-70.)

Italian (59)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test. Students educated in Italian-speaking countries may not register for courses below the 700 level.

401-402. Elementary Italian
For students without a previous knowledge of Italian. Development of basic skills in aural comprehension, speaking, writing, reading. 4 recitations, 1 practice drill, 2 laboratories. 4 credits.

503-504. Intermediate Italian
Intensive reading of complete texts of intrinsic literary and intellectual worth, formal review of grammar, training in oral and written expression of ideas. (Credit toward a minor. Open to freshmen.) 4 credits.

Geography (50)

William H. Wallace, *Professor and Chairman;* Robert G. LeBlanc, *Assistant Professor;* Robert L. A. Adams, *Instructor*

401, 402. Regional Geography of the World
A survey of the geography of the world, organized in terms of the major culture areas of the earth. Geography 401 considers the areas of Western culture — Europe and the New World countries of the Americas and Australia and New Zealand. Geography 402 is concerned with the study of Non-Western culture areas — Black Africa, The Dry World, Oriental Asia, and the Pacific. In each area the unique integration of human and physical phenomena that produces the distinctive character of the region is studied. Mr. Adams, Mr. LeBlanc, Mr. Wallace, 4 credits.

473. The Weather
Interpretation of atmospheric phenomena; heating and circulation of the atmosphere; nature and movement of air masses influencing the weather of North America. especially New England. Explanation of day-to-day weather changes as they occur by graphic analysis, including practical or applied meteorology. Mr. Chapman. 4 credits.

511. Geography of Anglo America
A regional and topical analysis of the United States and Canada. Physical features and human phenomena are studied

in the context of their contributions to the character of the area. Mr. Wallace. 4 credits. (Alternate years; not offered in 1969-70.)

531. Geography of Western Europe and the Mediterranean
A regional and topical analysis of the geography of Western Europe and the Mediterranean region. Major topics studied include the patterns of natural phenomena, cultural features, and economic systems. Most of the course is devoted to the analysis of the following regions: the British Isles, Northern Europe, the Benelux countries, Germany, Alpine Europe, France, and Mediterranean Europe. Mr. Wallace. 4 credits. (Alternate years; offered in 1969-70.)

532. Geography of the USSR and Eastern Europe
A systematic analysis of the Soviet Union and the Communist Bloc countries of Eastern Europe with an emphasis on the former. Topics include natural regions, population, ethnography, agriculture, manufacturing, transportation, and trade. The contemporary pattern of population and the location of economic activity are viewed from the perspectives of historical process, the physical resource base, and the economic ideology of Communism. Mr. LeBlanc. 4 credits. (Alternate years; offered in 1969-70.)

571, 572. Physical Geography
A systematic study of the geography of the earth in terms of climates, landforms, vegetation and soils. Geography 571 is concerned with the study of cartography, weather, and climate. Landforms, vegetation, and soils, and the integration of physical features in selected areas are studied in Geography 572. Mr. LeBlanc and Mr. Wallace. 2 lectures, 1 laboratory, 4 credits. (Alternate years; not offered in 1969-70.)

581. Cultural Geography
An analysis of the geographic pattern of mankind. The differentiation of the world in terms of population, race, language, religion, and economy. Emphasis is placed on the historical origin and the diffusion of these phenomena as well as their significance in understanding the contemporary culture map of the world. Mr. LeBlanc. 4 credits. (Alternate years; offered in 1969-70.)

582. Economic Geography
The analysis of the areal variation on the earth's surface in terms of man's activities related to the production, exchange, and consumption of economic goods. Agriculture, extractive industries, manufacturing, trade, transportation, and various tertiary activities will be investigated with regard to their location, their characteristics, and their relationships with other phenomena. Emphasis will be placed upon the development and application of various theories of location. Mr. Adams. 4 credits.

670. Climatology
The study of the climates of the world. A knowledge of the basic meteorological processes is assumed. Major topics studied include: The atmospheric circulation and its effect upon climates; climatic change; and the problems of climatic description and classification. Most of the course is devoted to the analysis of the climatic characteristics of the major regions of the world. Prerequisite: Geography 473 or Geography 572 or permission of the instructor. Mr. Wallace. 4 credits. (Alternate years; offered in 1969-70.)

782. Advanced Economic Geography
A conceptual analysis of the social and behavioral problems of resource allocation and use as they relate to man's economic activities. Varying views of resource adequacy and practices of resource utilization will be investigated with respect to population pressure, man's perception of his environment, changes in science and technology, and concerns for environmental quality. Emphasis will be placed upon methods of determining

resource adequacy, exploration of the meaning of resource scarcity, and an evaluation of man's decision-making mechanisms for resource allocation. Reference will be made to specific regions with particular reference to modern America. Mr. Adams. 4 credits.

783. Historical Geography of the United States
A geographic analysis of population, economy, and resources at several stages in the development of the United States to 1900. The study of places as they were in the past and as they were perceived. Mr. LeBlanc, 4 credits. (Alternate years; not offered in 1969-70.)

795. Special Project in Geography
The study of special problems in geography by means of readings, library, archival, and field work. This course is intended primarily for seniors majoring in geography. Prerequisite: permission of the instructor. Staff. 4 credits.

797. Seminar in Geography
The methodology and philosophy of geography. The course deals with the history of geographic thought, the organizing concepts of the discipline, and the approaches to geographic analysis. The definition and investigation of research problems from the geographic perspective. Primarily for seniors majoring in geography. Mr. Adams. 4 credits.

Geology (51)

Herbert Tischler, *Professor and Chairman;* T. Ralph Meyers, *Professor;* Donald H. Chapman, *Professor;* Cecil J. Schneer, *Professor;* Glenn W. Stewart, *Associate Professor;* Henri E. Gaudette, *Associate Professor;* Franz E. Anderson, *Assistant Professor;* Wallace A. Bothner, *Assistant Professor;* William J. Wiseman, Jr., *Assistant Professor*

Group A

401. Principles of Geology I
The earth and its history. A consideration of land forms and a discussion of the materials and structures of the earth's crust. Staff. 3 lectures, 1 laboratory, 4 credits. Offered both semesters.

501. Introduction to Oceanography
Descriptive and regional oceanography covering the physical, chemical, biological, and geological aspects of the sea. Mr. Anderson and Mr. Wiseman. 3 lectures, 4 credits.

781. Physical Geology
The materials and structures of the earth and the erosive agents that modify them are described in the lectures and are examined and studied in the laboratory and on field trips. This course is for certified elementary or high school science teachers who need an introduction to the earth sciences. (Not available for credit after completing Geology 401 or equivalent.) 4 credits.

Group B

Prerequisite: Geology 401 or 781.

402. Principles of Geology II
The earth and its history continued. The interpretation of past geologic events and their effect on the development of life forms. Staff. 3 lectures, 1 laboratory, 4 credits. Offered both semesters.

409. Environmental Geography
An understanding of geological processes allows man to use the products and forces of nature to exploit and manage his environment and to anticipate some of the unforeseen problems that may arise. Topics to be discussed will include: water resources; geologic hazards, such as landslides, earthquakes, stream erosion, and sedimentation; and land use, site investigations, and the exploitation of natural resources. Mr. Stewart. Prerequisite: Geology 401 or permission of instructor. 4 credits.

512. Descriptive and Determinative Mineralogy
The physical and chemical properties of minerals, their associations, modes of occurrence and uses with training in their identification. Mr. Meyers. Prerequisite: in addition to Geology 401, Chemistry 402 or 404. 2 lectures, 2 laboratories, 4 credits.

782. Historical Geology
The history and development of the physical features of the earth and the development of life on the earth. Fossil organisms will be briefly surveyed in the laboratory and the methods of historical geology will be illustrated in the laboratory and on field trips. Prerequisite: Geology 781 or equivalent. This course is for certified elementary or high school science teachers who need an introduction to the earth sciences. (Not available for credit after completing Geology 402 or equivalent.) 4 credits.

Group C

613-614. Mineralogy
First semester: Introduction to crystallography, the physics and chemistry of crystals, the atomic structure of minerals; mineral classification and the nonsilicate minerals. Second semester: Silicate mineralogy and structure; optic theory and optical mineralogy. Mr. Schneer and Mr. Bothner. Prerequisite: 1 year of college chemistry and/or permission of instructor. 3 lectures, 1 laboratory, 4 credits.

797. Geology Colloquium
Study of selected topics in both classical and modern geological thought. Designed for geology and earth science majors, 0 credit, NLG.

Group D

Geology 402 (or permission of the instructor) is a prerequisite for most courses in Group D in addition to other prerequisites shown with each course.

531. Structural Geology
The structural units of the earth's crust and the mechanics of their formation. Mr. Stewart. 3 lectures, 1 laboratory or field work, 4 credits.

561. Geomorphology
The factors producing the present aspect of the land surface, particularly that of New England. Special emphasis on the work of running water, glaciers, and marine agents. Field trips during the fall season. Mr. Chapman. 3 lectures, 1 laboratory, 4 credits.

632. Mapping Techniques and Field Geology
Training in basic techniques of geologic mapping. Mr. Stewart. Prerequisite: Geology 531. 1 lecture, 2 laboratories, 4 credits.

652. Invertebrate Paleontology
The classification, evolution, and stratigraphic occurrence of invertebrate animals as recorded by fossils. Field trips will be made to collect specimens and to study environments of living and fossil material. Mr. Tischler. 3 lectures, 1 laboratory, 4 credits.

662. Glacial Geology
The characteristics of existing glaciers and an interpretation of Pleistocene glacial features. The abundant and varied evidence of glaciation in northeastern North America and Baltic Europe will be emphasized and New Hampshire examples of both alpine and continental glaciation will be studied in the field. Mr. Chapman. 3 lectures, 1 laboratory, 4 credits.

Group E

Geology 613-614 (or permission of the instructor) is a prerequisite for most courses in Group E in addition to other prerequisites shown with each course.

725. Petrology-Petrography
The identification and classification of igneous, metamorphic and sedimentary rocks in hand specimen and thin section

with emphasis on mineralogic and textural relationships leading to an understanding of petrogenesis. Mr. Bothner. 3 lectures, 1 laboratory, 4 credits.

741. Geochemistry
Applications of thermodynamics to geological processes; geochemical differentiation of the earth; the principles and processes which control the distribution and migration of elements in geological environments. Mr. Gaudette. 3 lectures, 1 laboratory, 4 credits.

754. Sedimentation-Stratigraphy
The properties of sediments and sedimentary rocks, with emphasis on lithofacies, biofacies, principles of stratigraphic correlation and sedimentary tectonics. Mr. Anderson and Mr. Tischler. 2 lectures, 1 laboratory, 4 credits.

759. Geological Oceanography
Geologic properties of the earth that are unique to the continental shelves and ocean basins. Special emphasis will be placed on submarine geomorphology, eustatic sea level changes, crustal and subcrustal oceanic structure, and the evolution of the ocean basins. Mr. Anderson. Prerequisite: Geology 501 and Geology 754. 2 lectures, 1 discussion group, 1 special project, 4 credits. (Alternate years; not offered in 1969-70.)

771. Economic Geology
The distribution utilization and geology of mineral fuels and some related materials. Mr. Meyers. Prerequisite: Geology 402. 4 credits.

795. Geological Problems
1. Areal Geology
2. Geochemistry
3. Geomorphology, Advanced
4. Geophysics
5. Glacial Geology, Advanced
6. Groundwater Geology
7. Historical Geology, Advanced
8. Industrial Minerals
9. Micropaleontology
10. Mineral Fuels
11. Mineralogy, Advanced
12. Optical Crystallography
13. Ore Deposits
14. Paleontology, Advanced
15. Petrology, Advanced
16. Regional Geology
17. Sedimentation
18. Stratigraphy
19. Structural Geology, Advanced
20. Marine Geology
21. Physical Oceanography

Special problems by means of conferences, assigned readings, and field or laboratory work, fitted to individual needs from one of the areas listed above. Staff. 2 or 4 credits.

796. Honors Project
Independent research projects similar to Geology 795 for students with 3.0 or better average in geology. Staff. 2 or 4 credits.

German and Russian

James L. Sherman, *Acting Chairman;* Hermann W. Reske, *Professor;* Marron C. Fort, *Associate Professor;* Helmut Pfanner, *Associate Professor;* Guenter Herr, *Assistant Professor;* Alfredo Cappon, *Instructor;* Roman Legedza, *Instructor;* Hildegard S. Reske, *Instructor*

German (57)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

401-402. Elementary German*
For students without previous knowledge of German. Aural-oral practice and the study of fundamental speech patterns, reading and writing to achieve a firm basis for an active command of the

* A student educated in a foreign country will not be permitted to register for any German or Dutch course on the 400 and 500 level if German or Dutch is the student's native language.

language. No credit toward a major. Students who offer two or more entrance units of high school work in German will not be permitted to register for credit for German 401. 4 recitations, 2 laboratories, 4 credits.

403-404. Elementary Dutch*
For students without previous knowledge of Dutch. Aural-oral practice and the study of fundamental speech patterns, reading and writing to achieve a firm basis for an active command of the language. Students who offer two or more entrance units of high school work in Dutch will not be permitted to register for credit for Dutch 403. 4 recitations, 2 laboratories, 4 credits.

501-502. German Composition and Grammar Review*
A systematic review of German grammar and syntax. Concentration on the writing of compositions of gradually increasing difficulty, proceeding from concrete observations to theoretical and abstract discussion. 2 recitations, 1 laboratory, 2 credits.

507-508. German Oral Practice*
A systematic course in oral self-expression, stressing enunciation and intonation. Prepared and extemporaneous talks, dialogues, and group discussions. 2 recitations, 1 laboratory, 2 credits.

605-606. Introduction to German Literature
Reading and analysis of works selected from the most important periods in German literature. Outside readings on the historical and cultural background of the works read. Papers and discussion in German. Term paper in English. This course or its equivalent is prerequisite to all higher literature courses in German. Prerequisite: B or better in 402 or C or better in 502. 4 credits.

685-686. Junior Year at Marburg
A program of studies at the University of Marburg (West Germany) for students at the University of New Hampshire who have completed their sophomore year and have passed a minimum of four full courses of German with an average grade of B or better. Those applying will be expected to attend regularly during the semester preceding their year abroad a non-credit orientation seminar. Interested students should contact the department chairman. 32 credits.

691-692. Intermediate Composition and Conversation
A systematic study of grammar and syntax. Composition of increased difficulty. Oral training with goals toward greater fluency and accuracy of expression. Course will be conducted exclusively in German. Prerequisite: German 501-502, 507-508. 4 credits.

693-694. The German Novella
An extensive study of the German novella throughout the ages, with an interpretation of the most representative works by distinguished authors of this special literary genre. Course will be conducted exclusively in German. Prerequisite: German 606 or permission of instructor. 4 credits.

695, 696. Honors Work in German
For seniors writing a research paper in the honors program in German. Prerequisite: permission of department chairman. 2 or 4 credits.

701. Advanced Composition
A study of grammar and syntax. Composition of increased difficulty. Prerequisite: German 692 or equivalent. Summer Session only. 2 credits.

703. Advanced Oral Practice — Level I
For students with a fair knowledge of spoken German but who need more fluency of expression. Prerequisite: German 692 or equivalent. Summer Session only. 2 credits.

704. Advanced Oral Practice — Level II
An intensive course in oral self-expression. Lectures on assigned subjects. Pre-

requisite: German 703. Summer Session only. 2 credits.

707. Practical Phonetics
A study of the sound and rhythm of spoken German. Classroom discussions are supplemented by intensive use of the language laboratory. Summer Session only. 2 credits.

726. German Culture and Civilization
A survey of the historical, social, artistic and folkloristic developments in German-speaking countries from the beginning. Prerequisite: knowledge of German. 4 credits.

742. Old High German
A linguistic analysis of Old High German grammar and its historical development. Selected readings in Old High German literature. (Alternate years; not offered in 1969-70.) 4 credits.

743. Introduction to Middle High German
An introduction into the phonology and grammar of Middle High German, taking into consideration their development from Germanic through Middle High German into New High German. Reading of outstanding lyrics. Prerequisite: German 606. (Alternate years; not offered in 1969-70.) 4 credits.

744. Middle High German Epics
Selections and interpretations of the important Middle High German epics. Prerequisite: German 743. (Alternate years; not offered in 1969-70.) 4 credits.

755. German Literature of the Age of Baroque
German literature between Reformation and the Age of Enlightenment. Reading, interpretation, and critical analysis of prescribed prose, drama, and poetry with emphasis on the philosophical and social ideas of the time. Prerequisite: German 605-606. (Alternate years; offered in 1969-70.) 4 credits.

756. German Literature of the Age of Enlightenment
German literature from the Baroque period to the beginning of the period of Storm and Stress with emphasis on readings and interpretations of works of Lessing and Wieland. Prerequisite: German 605-606. (Alternate years; offered in 1969-70.) 4 credits.

757-758. The Age of Goethe
German literature of Storm and Stress and the Classical Period. Interpretation and critical analysis with emphasis upon selected works of Wagner, Klinger, Lenz, Schiller, and Goethe. Prerequisite: German 605-606. 4 credits.

759. German Romanticism
German literature from the end of the Eighteenth Century to 1930. Interpretation and critical analysis of prescribed prose, drama, and poetry of prominent writers and poets of the period, from Wackenroder to Eichendorff. Prerequisite: German 605-606. (Alternate years; not offered in 1969-70.) 4 credits.

760. Kleist, Holderlin, Jean Paul
Outstanding authors outside the Romantic School. Prerequisite: German 605-606. (Alternate years; not offered in 1969-70.) 4 credits.

761. Literature of Biedermeier, Junges Deutschland, and Vormarz
Outstanding works of Grillparzer, Morike, Stifter, Heine, Büchner, and others will be read and discussed, including social and philosophical developments of the post-Goethe period. Prerequisite: German 605-606. (Alternate years; offered in 1969-70.) 4 credits.

762. Age of Realism
Outstanding prose and lyrics of Keller, Meyer, Storm, Fontane, and others will be read and discussed, including social and philosophical developments since 1848. Prerequisite German 605-606. :(Alternate years; offered in 1969-70.) 4 credits.

763-764. German Literature Since 1880
From Naturalism to the present. Reading, interpretation, and critical analysis of prescribed prose, drama, and poetry of Hauptmann, Hofmannstal, Rilke, Mann, Kafka. Prerequisite: German 605-606. (Alternate years; offered in 1969-70.) 4 credits.

779. Phonology of German
A contrastive analysis of the sounds of English and German. Phonetics, morphophonemics, and distinctive features. Prerequisite: knowledge of German. 4 credits.

780. Structure of Modern German
A grammatical analysis of modern German employing structural, tagmememic and transformational models. Prerequisite: knowledge of German. 4 credits.

781. History and Development of the German Language
An insight into the history and development of the German language. Beginning with the Indo-European period, it traces the changes in sounds, structure, and vocabulary to the establishment of modern German. Prerequisite: German 686 or 692. 4 credits.

782. Advanced Stylistics
A systematic study of style, shades of meaning, adequacy of expression. A thorough knowledge of German grammar is prerequisite. Practice in writing seminar papers and obtaining stylistic flexibility in the use of written German. Training in bibliography. Prerequisite: German 686 or 692. 4 credits.

791. Methods of the Teaching of German
A critical study of modern language teaching on all levels from high school to college. The course emphasizes the practical approach of teaching and the use of modern equipment such as audio-visual aids, tape recorders, films, etc. The course is especially tailored for teachers of German in high school and colleges. 4 credits.

795-796. Special Studies in Germanic Language and Literature
Courses of study in special topics. Examples of topics which may be selected by instructors and students are: Gothic, Old Icelandic, Medieval and Renaissance Drama, Grimmelshausen's Simplicissimus, Goethe's Wilhelm Meister, Heinrich von Kleist, German lyrics of the Nineteenth Century, Nineteenth Century Bildungsroman, post-war German novel, etc. Prerequisite: permission of instructor 4 credits.

Russian (61)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

401-402. Elementary Russian*
Elements of Russian grammar. Oral practice and written drills designed to achieve a mastery of grammatical patterns. Reading of graded prose. Students who offer two or more entrance units of high school work in Russian will not be permitted to register for credit for Russian 401. No credit toward a major. 4 recitations, 2 laboratories, 4 credits.

501-502. Intermediate Russian*
Review of Russian grammar. Reading of prose and practice in oral and written expression. Open by placement examination and to students who have passed Russian 402 with a grade of C or better. 4 recitations, 1 laboratory, 4 credits.

605-606. Introduction to Russian Literature
Readings of selections from Russian literature. Discussion and composition based on the texts read. Prerequisite: Russian 502 with a grade of B or Russian

* Students educated in schools in which Russian is the language of instruction will not be permitted to register for any Russian course numbered 650 or below.

502 with a grade of C and permission of the instructor. 4 credits.

795-796. Special Studies in Russian Language and Literature
Courses of study in selected topics in Russian language and literature. 4 credits.

Greek
(See Spanish and Classics)

History (53)

William R. Jones, *Associate Professor and Chairman*; William Yale, *Professor Emeritus;* David F. Long, *Professor;* Hans Heilbronner, *Professor;* William Greenleaf, *Professor;* Darrett B. Rutman, *Professor and Director of Graduate Studies in History;* H. Trevor Colbourn, *Professor;* Gibson R. Johnson, *Associate Professor Emeritus*; Allan B. Partridge, *Associate Professor;* Robert C. Gilmore, *Associate Professor;* Charles A. Jellison, *Associate Professor;* Marion E. James, *Associate Professor;* Douglas L. Wheeler, *Assistant Professor;* Charles E. Clark, *Assistant Professor;* Marc L. Schwarz, *Assistant Professor;* Allen B. Linden, *Assistant Professor;* James Weingartner, *Assistant Professor;* John O. Voll, *Instructor;* J. Bradley Lentz, *Instructor*
Lower-division (500-level) courses are primarily designed for freshman and sophomore students; upper-division (600-700-level) courses are primarily for junior and senior students.
Students are not permitted to enroll concurrently in survey courses and advanced courses of the same area. Nor are they eligible to enroll in elementary courses after having completed advanced courses in the same area. Exemptions from this rule are possible only through petition.

Basic Course
The following course is recommended for students who desire a general introduction to the study of history.

501, 502. World History
A historical analysis of the fundamental developments in human societies from the Paleolithic Age to the present. Special effort is made to view history from a world perspective and to analyze social and cultural as well as political factors of the human experience. Staff. 4 credits.

Group I. American History
503, 504. History of the United States
American history from Washington's first administration to the present. Political, social, economic, and diplomatic aspects. Staff. 4 credits.

703. The Colonial Period of American History
Anglo-American from the late Sixteenth to the Mid-eighteenth Century, encompassing a general and interpretative view of the development of an Anglo-American culture along the eastern seaboard of North America. Mr. Rutman. 4 credits.

704. The Sources and Methods of Colonial American History
An introduction to the materials and methodology of the historian of Anglo-America structured around a series of problems underlying the interpretations considered in History 703, specific approaches to these materials, and what historians have done with the materials. Prerequisite: History 703 and (for graduate students) permission of the instructor. Mr. Rutman. 4 credits.

705, 706. America in the Eighteenth Century and the Revolution
American colonial and revolutionary history during the period from 1740 through the adoption of the Constitution and the establishment of Washington's first administration. Mr. Gilmore. 4 credits.

711, 712. Nineteenth-Century America
The historical factors, both domestic and international, involved in the development of the American Republic, its institutions and people, from the inception

of the new nation in 1789 to the emergence of the United States as a world power in 1900. Mr. Jellison. 4 credits.

715, 716. Twentieth-Century America
United States history since 1896, from the triumph of industrialism on the national scene to the emergence of America as a world power in the nuclear age. Political, economic, and diplomatic developments. Mr. Greenleaf. 4 credits.

719, 720. The Foreign Relations of the United States
Primarily the history of American diplomacy, with attention given to the non-diplomatic aspects of foreign relations. Mr. Long. 4 credits.

721, 722. Social and Intellectual History of America
The development of American thought and society, with emphasis on the relationship between ideas and events. The first semester, approximately one-half of which is devoted to the period before the American Revolution, covers topics of fundamental importance to the growth of American civilization from the beginning of English settlement to the eve of the Civil War. The second semester deals with similar topics and issues during the period from the Civil War to the present. Mr. Clark and staff. 4 credits.

723. American Historiography
An examination of the principal writings of American historians from the colonial period to the present time. Emphasis will be given to those works that pertain mainly to the American people and their immediate neighbors. Mr. Jellison. Prerequisite: permission of instructor. 4 credits.

724. American Urban History
The primary emphasis of this course will be on the development of urban society in America from Colonial times to the present. However, lectures will also explore the comparative histories of European and American cities. Mr. Mennel. 4 credits.

Group II. European History

535, 536. Modern European History
Europe from the end of the Middle Ages to the present. The evolution of the national state; international relations; the expansion of Europe overseas; and the background of modern Western civilization especially its ideas, literature, and art. A basic course for those who with to proceed further in the study of European history as well as a survey for those who are interested in special aspects of Western cultural development. Staff. 4 credits.

559, 560. History of England
The history of the British Isles from earliest times to the present, and a consideration of the British Empire and Commonwealth of Nations. A parallel to English literature, a background to American political history, and a study of English culture and institutions in the democratic and social integration of the world. Mr. Partridge. 4 credits.

739, 740. Three Medieval Civilizations
A study of the demise of classical antiquity in the lands bordering the Mediterranean and the genesis and fruition of three new cultural traditions; the Latin Christian; the Islamic; and the Byzantine. Stress will be put on religious, literary, and scholarly survivals and innovations from 400 A.D. to 1400 A.D. Mr. Jones. 4 credits.

743. Renaissance and Reformation
The history of Europe during the Fifteenth and Sixteenth centuries with primary emphasis on the Italian Renaissance, the Protestant Reformation, and the emergence of the national state. Staff. 4 credits.

749. The Age of Revolution
Revolution as a socio-political phenomenon in its historical setting. Comparative approach to Puritan, American, and French Revolutions with reference to contemporary movements. Mr. Gilmore. 4 credits.

756. Twentieth-Century Europe
European history in the Twentieth Century from the point of view of a civilization in a constant state of crisis. World War I, the inter-war period, World War II, and the attempts to solve the conflicts of modern society after that war in terms of new economic, political, and cultural patterns will represent the core of the study. The effects of extra-European influences, the loss of European primacy, and continued strife within the structure of the European state and cultural system. Mr. Heilbronner. 4 credits.

(759). History of Modern Spain and Portugal
The Iberian states and their peoples from the coming of Nineteenth Century liberalism to the present. Political and social change will be emphasized but attention will be paid to imperial activity as well as to intellectual movements. External influences of European thought and activity will be considered as relevant to the study of two modernizing countries with persistent traditions. Mr. Wheeler. 4 credits.

761, 762. England in the Tudor and Stuart Periods
An examination of the political, religious, socio-economic, and intellectual forces for change at work in England from the accession of Henry VII to the death of Queen Anne. Mr. Schwarz. 4 credits.

763, 764. History of Russia
The development of the Russian state from its foundation to its present status as a world power. The course is designed to increase the understanding of the present in terms of the past. Political developments, foreign relations, and intellectual and ideological currents. Mr. Heilbronner. 4 credits.

767, 768. History of Germany
Germany and the various German states from the Reformation to the Third Reich and the presently divided Germany. The course will emphasize the relationship and importance of Germany to the rest of Europe. Mr. Lentz. 4 credits.

771, 772. History of England Since 1714
Particular emphasis will be placed on the development of Parliamentary democracy and the changing economic and social structure of the country. Mr. Kemnitz. 4 credits.

774. European Historiography
An examination of selected works of historical literature since the Reformation. Emphasis will be placed on the comparison of different schools of historical interpretation, the development of historical methods, and the impact of Romanticism, Idealism, Nationalism, and Positivism on the composition of historical literature. Staff. 4 credits.

Group III. Non-Western History

531, 532. Latin-American History
The development and influence of Spanish and Portuguese culture as a widespread world force; the history of the Latin-American peoples; the relationship of Latin America to North America, particularly in view of recent growth in friendly and diplomatic relations. Mr. Partridge. 4 credits.

575. The Ancient Near East
A history of the Near East from the neolithic revolution to the time of Alexander the Great. Special attention will be given to the rise of civilization, the nature of man's artistic and intellectual development in the earliest civilizations of Mesopotamia and Egypt, and Judaism in its historical setting. Miss James. 4 credits.

576. The Aegean World
A history of the Aegean area from Crete to the death of Alexander the Great in 323 B.C. Miss James. 4 credits.

579, 580. The History of China and Japan
The development of Chinese and Japanese civilizations from their origins to the present. The course is intended to

help the student understand how modern Chinese civilization and modern Japanese civilization reflect the conflict of traditional values of the Chinese and Japanese peoples and modern values learned from Europe and America. Mr. Linden. 4 credits.

585, 586. The History of the Middle East
The history of the Middle East from the time of Muhammad to the present. The first semester covers the origins and expansion of Islam and the nature of medieval Islamic civilization. The second semester covers Ottoman history, relations with European powers, and the emergence of modern nations in the Middle East. Mr. Voll. 4 credits.

587, 588. History of Africa South of the Sahara
Africa from ancient times to the present. First semester covers from prehistoric times to 1860. Second semester from 1860 to the present. Topics analyzed will include African migrations, kingdoms and societies, African responses to the slave trade, Islam, European imperialism and colonialism, and industrialization. African nationalism, independence, and post-independence problems will be studied. Mr. Wheeler. 4 credits.

777, 778. The Hellenistic-Roman World
The history of the Mediterranean and the Near East from the death of Alexander the Great to the collapse of the Roman and Persian Empires (Fifth to Seventh centuries A.D.). The course will cover the main political and social developments of the area, but will give most consideration to artistic, scientific, philosophical, and religious trends, with particular emphasis on the rise of Christianity, Zoroastrianism, and the general religious climate that prepared the way for Islam. Miss James. 4 credits.

(781). History of Modern China, 1850-1950
A study of the modernization of China. The course will be concerned with the political, social, and cultural changes which have occurred in China from its early contacts with the West to the establishment of the Communist regime. Mr. Linden. 4 credits.

784. History of Southern Africa Since 1820
A study of the struggle for political and economic control in the only region of Africa where European groups remain in power. With special attention to the development of European hegemony, the course will trace the impact of European imperialism, European settler nationalism, racial conflict, economic competition and industrialization, Apartheid, and Assimilation. Included will be a discussion of official American policy in this region. Mr. Wheeler. 4 credits

785. The Modern Middle East
A history of the Middle East from the Eighteenth Century to the present time, with special attention given to the problems created by modernization and reform of the traditional society, the conservative reaction to reform, the impact of nationalism, and the appearance of new ideologies. Mr. Voll. 4 credits.

(787). Black Consciousness and Protest
A survey of the origins and cause of the rising consciousness and consequent activism of the peoples of Negro descent in the New World and in Africa from the early Nineteenth Century to the present. Will include lectures, discussions, and panels on protest literature, black nationalism, Pan-Negroism, Pan-Africanism, *negritude,* the Nation of Islam, and separatist religious sects in the Americas and Africa. The framework of the course will be cross-cultural and multi-disciplinary. Mr. Wheeler. 4 credits.

793. Problems in World History
The course views history through a "macro-historical" perspective. The historical experience of the whole human com-

munity is the basis for discussion of historical developments and problems. Students present oral and written reports as a part of the effort to synthesize knowledge of the histories of separate areas. Permission of the instructor is required. Open to students with a broad background in history. Mr. Voll. 4 credits.

Group IV. Special Courses

695, 696. Honors Program
An honors program involving two types of work: (1) The student pursues independent study in one or more specialized areas according to the requirements of the existing independent study program. (2) The student attends a seminar in which he discussed the relevance of other disciplines to historical studies. He will also be given the opportunity in these seminars to discuss his own research with members of the faculty and other participating students. Prerequisite: a cumulative average of 3.0 or show exceptional aptitude for history. Each case will be judged individually. 4 or 8 credits.

(697). Colloquia For Senior History Majors
Intensive study of selected historical subjects in seminar or colloquium. Topics and instructor to be announced each year. Open only to history majors. This course is required of all history majors and it is expected that they will take this course during their senior year. Juniors may be admitted with the permission of the instructor. May not be repeated for credit except with the permission of the department. Offered both semesters annually. Depending on the particular subject, may be used to satisfy major requirements in American, European, or non-Western history. Staff. 4 credits.

(789). Seminar in the History of Science
Selected topics, conducted through special lectures, individual study, oral and written reports. The subject will vary from year to year. This course is the same as Physical Science (789). Mr. Schneer. Cannot be used for credit in history without permission of the History Department. Prerequisite: permission of adviser and instructor. 4 credits.

History-Education 791. Problems in the Teaching of High School History and Other Social Studies
Bibliography and new interpretations of history; the social studies curriculum, past and present; aims and objectives in the social studies; selection and organization of teaching material; teaching and testing techniques. Special emphasis on teaching American history and the problems of American democracy. This course may not be used to satisfy major requirements. Mr. Draves. 4 credits.

(797). Colloquia in History
Selected topics in American, European, and non-Western history. Open to advanced undergraduate and graduate students. Prerequisite: permission of the instructor. Depending on the particular subject, may be used to satisfy the major requirements in American, European, or non-Western history. Staff. 4 credits.

Home Economics (31)

Marjory A. Wybourn, *Professor and Chairman;* M. Elizabeth Rand, *Associate Professor;* Mary E. Holder, *Associate Professor;* Earl O. Goodman, *Associate Professor;* James L. Spangenberg, *Associate Professor;* Sylvia Marple, *Assistant Professor;* Virginia Griewank, *Instructor;* Andrea Desjardins, *Instructor;* M. Priscilla Royal, *Instructor;* Helen P. Hall, *Lecturer;* Leandre Poisson, *Instructor;* part-time

307, (307). Workshops
Supervised, non-credit workshops to develop skills in areas of individual need. A student may enroll in a workshop at any time it is scheduled in order to achieve the degree of skill desired. There

may be some expense involved for materials. Limited to home economics majors. No credit. 1. Basic Clothing Construction; 2. Tailoring; 3. Basic Food Preparation; 4. Evaluation Devices; 5. Creative Activities for the Young Child; 6. Demonstration Techniques; 7. Home Management Techniques; 8. Interior Design.

407, 607. Professional Seminars
Designed to help the student define and clarify professional and educational objectives, to become acquainted with the philosophy, focus, and issues in home economics and with professional opportunities in the field. A student may enroll in the first half of the course in the freshman or sophomore year and the second half in the junior or senior year. Field trips and guest speakers will be an integral part of the course. There may be some cost involved for transportation. 2 credits each semester, NLG.

462. The Family in Societal Change — A Symposium
Why does a family exist? Are families needed in contemporary societies? What is a family? How are families affected by environment? How are individuals affected by families? These are some of the questions which will be explored in an attempt to bring together and evaluate various points of view on crucial issues influencing families today. The focus will be cross-cultural, with participants and resource person from various cultures. Conducted as a symposium with guest lecturers, faculty and student reactor panels, small group discussions, and guided reading. There will be opportunity for some community field trips and observation experiences with families. 4 credits.

465. Man in Families — A Symposium
How is self concept formed and affected by families? How are male-female roles identified? How are man's food, clothing and shelter needs and functions satisfied and managed? How do child rearing practices differ? These are some of the questions which will be explored in a cross-cultural symposium. Lectures by guests and faculty members, reactor panels of family members from various income levels and cultural backgrounds, small group discussions, and guided reading. There will be opportunity for some participation with family groups. Not offered in 1969-1970. 4 credits.

507, (507). Field Experience
A supervised experience in the community which provides opportunity for students to explore various careers opportunities in nursery schools, day care centers, cooperative extension, programs for the handicapped, youth groups, schools, community and family welfare agencies, hospitals, and others. Prerequisite: home economics major and permission. One or more semesters. 2 or 4 credits.

514. Textiles
Factors which affect the acquisition and use of clothing and textile products. Special consideration given to textile fiber and fabric properties, producer-retailer-consumer interrelationships, and the textile industry. 4 credits.

525, (525). Human Development
An examination of theories and supportive research concerning the development and guidance of the child from conception through adolescence. Observation in the preschool laboratory and/or other situations is included. 4 credits.

531, (531). Environmentics
The processes that shape man's environments, i.e., philosophical, historical, scientific, creative, aesthetic. Application to interior design projects with emphasis on design. 4 credits.

557. Consumer Education
The role and responsibility of the consumer in an economic society; special consideration given to selection and use of market goods and services. Team teaching by faculty from the areas of

management, food, nutrition, clothing, and textiles. 4 credits.

573, (573). Human Nutrition
The functions, acquisition and utilization of essential nutrients and the relation of nutrition to health during the various stages of life and in stress situations. 4 credits.

583. The Young Adult
The concerns of the young adult from his viewpoint. Topics considered will include body change, social relations, personal achievement, respect, and issues identified by students. 4 credits.

615, (615). Specialized Clothing Construction
The interrelationship of methods, processes, and techniques involved in pattern designing, custom tailoring, and advanced clothing construction. Laboratory experiences are provided for application of and experimentation with selected principles. Mastery of basic skills is assumed. 4 credits.

626. The Young Child
Normal development and behavior with emphasis on the research concerning infancy and early childhood. The student will design and conduct an individual study with young children. Prerequisite: Home Economics 525 or equivalent. 4 credits.

627. Creative Activities in Preschool Programs
An exploration of how needs of young children are met through art, music, drama, literature, and science experiences. The focus will be an appreciation and understanding of the creative process and guidance of activities as a basis of curriculum development in preschool programs. The student will observe and participate in preschool programs. Prerequisite: Home Economics 525, home economics major, or permission of instructor. 4 credits.

657, (657). Management and Decision Making in the Family
An examination of the integrated nature of management in the family as a means to the realization of family goals and values. Particular emphasis is given to the decision function as the crux of management. Opportunities will be provided for direct experience in family situations. 4 credits.

671. Introduction to Food Science
Introduction to the experimental study of food, application of the principles underlying food preparation, and experimentation in comparative food preparation. Prerequisite: knowledge of basic food preparation principles. 4 credits.

674. Quantity Food Purchasing and Production
Principles and methods of quantity food purchasing and production. Laboratory experiences in University Dining Halls. Prerequisite: basic food preparation and permission of instructor. 4 credits.

683, (683). Family Relations
An examination of theories and supporting research concerning dynamics and patterns of interaction, role behavior, and development in families in specific cultural settings. Prerequisite: some background study in the behavioral sciences. 4 credits.

685, (685). One Semester at the Merrill-Palmer Institute
A junior or senior student in the Department of Home Economics may attend the Merrill-Palmer Institute in Detroit, Michigan. Enrollment by application to the Department of Home Economics. See page 71. 15-17 credits.

(694), 694. Supervised Teaching in Home Economics and Family Life
Supervised teaching in a school. See page 83 for a description of the secondary student teaching blocked program. 8 credits.

695, (695). Independent Study
A student who has shown special ability in a selected area of home economics may, with department approval, elect to work on a problem of special concern in the area of her choice. Regular conferences with an adviser are required. Prerequisite: department permission. One or more semesters. 2 or 4 credits.

707, (707). Practicum with Children and Families
A planned supervised experience with children or families at both participating and observing levels. The practicum is designed to increase the students' awareness and understanding of the ways human beings grow and behave and the dynamics of the family. Weekly discussions will be combined with individual and small group supervisory conferences. Students have the opportunity to choose a focus for their practicum from among the following areas: 1. Young children, e.g., preschool program; 2. School-age children; 3. Adolescents; 4. Adults and parents; 5. Low-income families, e.g., management experiences. Prerequisite: home economics major and permission. One or more semesters. 2 or 4 credits, maximum of 6 credits in one area.

715. Clothing in Relation to Human Behavior
The analysis of research and theory in the social psychological aspects of clothing. An exploration and study of clothing behavior of individuals and groups. Special emphasis given to stages of the life cycle, development of the self, and the phenomenon of fashion. 4 credits.

725. Preschool Programs
The organization and operation of programs for young children. Theoretical knowledge about children and educational techniques will be related to the curriculum, facilities and administration in a variety of group programs for young children. Field trips will be planned. Prerequisite: Home Economics 627, home economics major, or permission of instructor. 4 credits.

754. Personal and Family Finance
Major financial alternatives available to families during the various stages of the family life cycle. 4 credits.

774. Nutrition and Disease
Application of principles of normal nutrition to clinical problems with description of altered nutrient requirements in human disease. Diet therapy as an applied aspect of clinical nutrition is considered. A practicum in a field situation will be a part of the experience. Prerequisite: Home Economics 573 or equivalent. 4 credits.

(776), 776. Nutrition — A World View
The major nutritional problems facing the world today. Consideration of protein-calorie malnutrition, obesity, nutritional status of adolescents, and special nutritional problems of pregnancy, infancy, childhood, and the aging. An exploration of concepts and methodologies for nutrition education. Prerequisite: Home Economics 573 or equivalent. 4 credits.

786. Dynamics of Family Change
An examination of the theories and supporting research of the intervention techniques used to affect changes in family behavior. The secondary focus is the student's examination of his interaction processes and their effect on intervention efforts. Prerequisite: Home Economics 683 and Psychology 545. 4 credits.

791, (791). Methods of Teaching Family Life and Home Economics
Home economics education in the school program, curriculum materials, methods, and resources in teaching home economics and family life. Offered each semester as part of the secondary student teaching blocked program and as an independent course in alternate years. 4 credits.

Hotel Administration (74)

403. Elements of Institutional Administration
The various components of the services sector with emphasis upon the lodging and feeding segment. Laboratory experience enhances the understanding of production-service facilities and personnel performance. 4 credits.

410, 412, 614, 616. Workshop for Public Services Management
A series of empirical discussions, moderated by selected administrative representatives of public housing, volume feeding, leisure time, and allied fields. NLG. 2 credits for series completion.

509. Financial Analysis and Controls
A specific approach to the unique controllership of the lodging and feeding industries, demonstrating concern for the perishable commodities as related to the personal production, service, time factors and the mobile characteristic of the customer. 4 credits.

655. Management for Transient, Leisure, and Institutional Services
Planning of feasibility, development, financing, and organization, relating to the price mechanism involving costs and economic life. Case studies provide observation of production and cost functions, human motivation, and institutional behavior, with the customers present. 4 credits.

656. Management of Physical Structures
Analysis of the components of physical structures as functional units through logical development of principles rather than application of formulae and rigid rules. The concept of building management is presented as demonstrating the interdependence of planning, construction, equipment, maintenance, personnel, and the on-premise customer. 4 credits.

666. Markets and Promotion of Public Services
Aspects of the services market with emphasis on consumer behavior. Internal and external stimulation of sales in competitive and non-competitive markets, and the vagaries of environmental concept. Experimental techniques embodied in industry sponsored sales blitz activities. 4 credits.

667. Functional Management
Experiences in organizational behavior within the framework of functional services. The responsibility of management is assumed in various roles involving marketing, promotion, sales, production, personnel, and customer attitudes. 4 credits.

695. Independent Analysis
An independent study and research project for honor students performed for the advancement of knowledge in the lodging and feeding fields. Prerequisite: senior standing and permission of instructor. 4 credits.

698. Seminar
Explorations of techniques, procedures, and policies of the service industries. Case studies augmented through discussions of the various related areas of administration. 2 credits.

Humanities (43)

501-502. Humanities
A course in general education involving the departments of English, French and Italian, German and Russian, Spanish and Classics, Philosophy, The Arts, and Music. It aims to develop an appreciation of literature, the various arts, and philosophy, and to give an understanding of western cultural traditions. The course will operate within an historical framework but is not intended to be an historical survey. Weekly lectures or demonstrations, readings, slides, films, record-

ings, class recitations, and discussion. There will be at least one museum trip each semester. Mr. Caldwell, Mr. Casas, Mr. Daggett, Mr. Leighton, Mr. Maynard, and guest lecturers. Not open to freshmen. 4 credits.

Italian

(See French and Italian)

Latin

(See Spanish and Classics)

Liberal Arts (40)

695, 696. Independent Study (Honors)
Independent study for the College of Liberal Arts junior or senior honor student whose major department has no independent study course. Prerequisite: junior or senior with honor standing (cumulative average of at least 3.0), approval of student's supervisor, and the department. A junior may register for a total of 8 credits and a senior for a total of 12 credits. See description of the College of Liberal Arts Honors Program.

Mathematics (84)

M. Evans Munroe, *Professor and Chairman;* William L. Kichline, *Professor;* Robert J. Silverman, *Professor;* A. Robb Jacoby, *Professor;* Shan S. Kuo, *Professor of Applied Mathematics;* James Radlow, *Professor of Applied Mathematics;* Edward H. Batho, *Professor;* Richard E. Johnson, *Professor,* Shepley L. Ross, *Professor;* Richard H. Balomenos, *Professor of Math-Ed;* A. H. Copeland, Jr., *Professor;* David M. Burton, *Associate Professor;* William E. Bonnice, *Associate Professor;* Robert O. Kimball, *Associate Professor;* Eric Nordgren, *Associate Professor;* Frederick J. Robinson, *Assistant Professor;* William G. Witthoft, *Assistant Professor;* Merle D. Guay, *Assistant Professor;* Samuel D. Shore, *Assistant Professor;* Roger H. Hou, *Assistant Professor;* Christopher C. White, *Assistant Professor;* Albert B. Bennett, Jr., *Assistant Professor;* Berrien Moore, III, *Assistant Professor;* B. Robert Ellis, *Instructor;* James W. Estes, *Instructor*

301. Survey of Computers and Their Applications
Discussion of the uses and limitations of computers in business and science. Movies and speakers will present current trends. Students will write one simple load and go program as a demonstration of a stored program. 0 credit.

401. Introduction to Digital Computer Programming with Non-Business Applications
Development of algorithms and programs. Basic programming and programming structure utilizing the FORTRAN II language. Introduction to FORTRAN IV and the use of an operating system. Basic data representation. Computer solution of numerical and non-numerical problems. 2 credits.

403. Introduction to Digital Computer Programming with Business Applications
An introduction to the basic concepts of electronic digital computers and data processing with emphasis on business applications. Topics covered are elementary programming techniques, flowcharting, Fortran II and IV. Students will use the IBM 1620 and IBM 360. Designed for business students with no previous knowledge of computers or college mathematics assumed. 2 credits.

404. Intermediate Programming of Digital Computers
Use of operating systems and programming systems. Data representation and the use of number systems in computers. Basic computer organization. Survey of

computers, systems, and applications. Computer solution of numerical and non-numerical problems using the IBM 360's operating system and remote access computing system. Prerequisite: Mathematics 401 or 403. 2 credits.

410. Digital Computer Systems
Development of algorithms and programs. Basic programming and program structure utilizing the FORTRAN II and FORTRAN IV languages. Use of programming systems and operating systems. Data representation and the use of number systems in computers. Basic computer organization. Survey of computers, languages, and applications. Computer solution of numerical and non-numerical problems using the IBM 1620 and the IBM 360's operating system and remote access computing system. Designed for non-business students. 4 credits.

415. Mathematics of Business and Economics
Topics in analytic geometry, integrals and derivatives, partial derivatives, max-min problems (in one and several dimensions), areas, matrices, and systems of linear equations. Prerequisite: 3 entrance units in college preparatory mathematics. 4 credits. Classes through reading period.

420. Fundamental Mathematics
A presentation of basic ideas in several branches of mathematics; sets and functions, calculus, linear algebra, linear programming, abstract algebra. Prerequisite: 3 entrance units in college preparatory mathematics. 4 credits.

425. Calculus I
First course in analytic geometry and calculus. Prerequisite: at least 3 entrance units in college preparatory mathematics including trigonometry. 4 credits. Classes through reading period.

426. Calculus II
Conclusion of introductory course in calculus of functions of one argument. Prerequisite: Mathematics 425. 4 credits. Classes through reading period.

527. Differential Equations
Basic exact and approximate methods for solving ordinary differential equations; first order equations; higher order linear equations; sequences and infinite series; series solutions of second order linear equations; linear systems; Laplace transforms; elementary nonlinear equations. Prerequisite: Mathematics 426. 4 credits. Classes through reading period.

528. Multidimensional Calculus
Theory, methods, and applications of partial differentiation; composite functions and chain rules; maxima and minima; transformations; vector algebra; vector functions; gradient, divergence, and curl; curves and surfaces; multiple, line, and surface integrals; integral theorems. Prerequisite: Mathematics 426. 4 credits. Classes through reading period.

621. Arithmetic for Elementary School Teachers
Basic concepts of logic and sets; real numbers and subsystems (properties, history, algorithms, problems of pedagogy); numeration systems; number theory (elementary properties of integers, Euclidean algorithm, divisibility, and figurate numbers). 4 credits.

622. Algebra for Elementary School Teachers
Functions (relations, operations, graphs, polynomials and their roots, and systems of equations); finite systems (modular arithmetic, linear congruence, and symmetries); groups, rings, and fields (elementary concepts with applications to numbers systems and factoring.) Prerequisite: Mathematics 621. 4 credits.

623. Geometry for Elementary School Teachers
Euclidean geometry (constructions and basic concepts of plane and solid geometry); analytic geometry (basic concepts, applications to geometry), congruences and similarity, vectors (operations

and applications). Prerequisite: Mathematics 622. 4 credits.

635. Partial Differential Equations
Sturm-Liouville problems; exact and approximate determination of characteristic values and functions; Fourier series and Fourier integrals; solution of boundary value problems for partial differential equations by series and integrals; classification, canonical forms, and basic concepts of second order; linear partial differential equations; elliptic, parabolic, and hyperbolic equations. Prerequisite: Mathematics 527 and 528. 4 credits.

640. Linear Algebra
Vector spaces, matrix algebra, bases and linear transformations, determinants, inner products, quadratic forms. Prerequisite: Mathematics 426. 4 credits.

656. Introduction to Number Theory
Unique factorization, linear and quadratic congruences, quadratic reciprocity law, arithmetic functions, quadratic forms, an introduction to algebraic numbers. Prerequisite: Mathematics 640. 4 credits.

657. Geometry I
Fundamental properties of Euclidean geometry from an advanced standpoint. Prerequisite: Mathematics 640. 4 credits.

658. Geometry II
Systems of postulates of various geometries, geometric invariants, synthetic and analytic projective geometry, introduction to non-Euclidean geometry. Prerequisite: Mathematics 640. 4 credits.

682. Non-Linear Differential Equations
Phase plane analysis of linear and nonlinear autonomous systems; critical points; limit cycles; periodic solutions; approximate methods for second order nonlinear ordinary differential equations; stability and asymptotic behavior of solutions of linear and non-linear equations. Prerequisite: Mathematics 527. 4 credits.

696. Independent Study
Individual study projects in various areas of mathematics as determined to be of interest and value to the student and the department. Supervision is by an appropriate faculty member. Consent of the faculty supervisor and department chairman is required. 1-6 credits.

698. Senior Seminar
Individual study on special topics. Preparation and presentation of reports on topics assigned. Prerequisite: senior standing in mathematics. 4 credits.

710. Advanced Programming Systems
An introduction to computer systems organization, machine language, and digital representation of data. Software studied are compilers, assemblers, loaders, system utility programs and macros. All programming will be done in basic assembly language on the IBM 360. Prerequisite: Mathematics 410 or equivalent. No credit given to students who have passed Mathematics 754. 4 credits.

735. Probability
Sample spaces (discrete and continuous); random variables; conditional probability; moments; binomial, Poisson and normal distributions; limit theorems for sums of random variables. Prerequisite: Mathematics 528. 4 credits.

736. Statistics
Sampling theory, estimation of parameters, testing of hypotheses, non-parametric methods. Prerequisite: Mathematics 735. 4 credits.

753-754. Numerical Methods and Computers
This course is oriented toward the use of numerical analysis on digital computers (with laboratory). Computer organization, algorithmic languages, and compilers, solution of polynomial and transcendental equations, numerical solutions of differential equations, linear systems of equations, eigenvalues and eigenvectors, polynomial interpolation, quadra-

ture, curve fitting, discussion of errors, systems simulations, and mathematical optimization techniques. Selected algorithms will be programmed for solution on high-speed computers in the Computation Center. Prerequisite: Mathematics 401 and 527. 4 credits.

763-764. Abstract Algebra
Groups, rings, integral domains, fields, and linear algebra. Prerequisite: Mathematics 640. 4 credits.

765-766. Advanced Calculus
A rigorous study of limits, derivatives, and integrals in one and several dimensions, vector calculus, line and surface integrals. Prerequisite: Mathematics 528. 4 credits.

767-768. Real Analysis
Topology of the real line, sets and countability, metric spaces, topology of Euclidean spaces, limits, sequences and series, continuity, differentiation, integration, uniformity of limit operations, equicontinuity, function spaces, inverse and implicit function theorems. Prerequisite: Mathematics 528. 4 credits.

776. Logic
Development of formal mathematics. Discussion within that system of formal systems. Consistency, completeness, decidability. Prerequisite: Mathematics 640. 4 credits.

780. Theory of Ordinary Differential Equations
Fundamental existence and uniqueness theorems; linear systems and higher order linear equations; Wronskian theory; classical Sturm Theorem and generalizations; boundary value problems for second order linear equations. Prerequisite: Mathematics 527, 640, and 767. 4 credits.

784. Topology
Basic topological notions, connectedness, compactness, metrizability, with special emphasis on the real line and plane. Prerequisite: Mathematics 640. 4 credits.

788. Complex Analysis
Complex functions, sequences, limits, differentiability and Cauchy-Riemann equations, elementary functions, Cauchy's theorem and formula, Taylor's and Laurent's series, residues, conformal mapping. Prerequisite: Mathematics 528. 4 credits.

791. Mathematics-Education
A study of secondary school mathematics curriculum problems and the recommendations of various study groups concerning secondary school mathematics. Prerequisite: Education 481 and 757. 4 credits.

793. Calculus on Manifolds
Differentiable manifolds; differential forms; exterior and Grassman Algebras; integration of differential forms; Stokes Theorem; closed and exact differential forms. Prerequisite: Mathematics 640 and 767. 4 credits.

Mechanical Engineering (85)

Robert W. Corell, *Professor and Chairman;* Edward T. Donovan, *Professor Emeritus;* E. Howard Stolworthy, *Professor Emeritus;* Godfrey H. Savage, *Professor;* Charles K. Taft, *Professor;* Asim Yildiz, *Professor of Mechanics;* Tenho S. Kauppinen, *Associate Professor;* Russell L. Valentine, *Associate Professor;* E. Eugene Allmendinger, *Associate Professor;* Douglas M. Norris, Jr., *Associate Professor of Mechanics;* William Mosberg, *Associate Professor;* Victor D. Azzi, *Associate Professor of Mechanics;* Wayne M. Beasley, *Adjunct Professor of Materials Science;* Frederick G. Hochgraf, *Associate Professor of Materials Science;* William E. Clark, *Assistant Professor;* John A. Wilson, *Assistant Professor;* Harvard B. Emery, *Assistant Professor;* Robert W. Alperi *Assistant Professor*

341. Introduction to Manufacturing
A course to orient students so that they can safely operate basic machine tools on design projects or in a home workshop. 2-2½-hour sessions per week for 6 weeks (first half of semester). No reading period required. 0 credit.

441, (441). Engineering Graphics and Computer Programming
Communication of engineering information and three-dimensional concepts by multiview drawings, pictorial views, sketches, and graphs; including the fundamentals of descriptive geometry, and elements of computer techniques. 3 laboratories, 4 credits.

501-502. Dynamic Linear Systems I and II
Dynamics of electrical and mechanical linear systems, mathematical modeling, linear system transient and steady-state analysis, Laplace transforms and convolution, Fourier series and spectra. Prerequisites: Mathematics 426 and Physics 408. 2 lectures, 2 recitations, 4 credits.

503 (503). Thermodynamics I
The fundamental laws of thermodynamics and their relation to working substances. Prerequisite: Mathematics 426. 4 credits.

504. Thermodynamics II
A comprehensive study of the laws of thermodynamics and their application to real systems; behavior of ideal and real media; thermodynamics of non-reactive and reactive mixtures. Prerequisite: Mechanical Engineering 503. 4 credits.

508. Fluid Dynamics
Introduction to the dynamics and thermodynamics of compressible and incompressible fluid flow; analysis of the behavior of fluids as expressed by hydrostatic, continuity-momentum, and energy equations. Prerequisite: Mechanical Engineering 503 and 524. 4 credits.

515-516. Systems Laboratory I and II
Introductory experiments with electrical and electromechanical systems. To be taken concurrently with Mechanical Engineering 501, 502. 1 credit.

523-524. Solids Mechanics I and II
The static and dynamic behavior of rigid and deformable bodies. Equilibrium compatibility, and force-deformation relations; stress, strain, and constitutive relations; elastic stability; energy methods; stress and deformation in structural elements and simple structures. Review of particle dynamics; kinematics and kinetics of rigid bodies. 4 credits.

541. Manufacturing Processes and Design
Manufacturing drawings, sketching basic mechanisms found in machine shops, operation of basic machine tools. ½-hour lecture before 2-hour laboratory (2 times per week), no reading period required, 4 credits.

542. Methods in Manufacturing
A project course for students who wish to obtain more experience on machine tools. Prerequisite: Mechanical Engineering 341 or 541. Two 2½-hour laboratories per week, no reading period required, 2 credits.

561. Materials I
Theoretical and experimental studies of the structure and thermodynamics of solids. 3 lectures, 1 laboratory, 4 credits.

562. Materials II
The origins of the electronic and mechanical properties of solids. 3 lectures, 1 laboratory, 4 credits.

643-644. Elements of Design I and II
Synthesis, analysis, and design of machine components. Development of engineering judgement; selection of materials; kinematic arrangements; design factors; failure criteria; fluctuating loads; design for finite and infinite life; stress concentration; statistical methods. Prerequisites: Mechanical Engineering 523, Mechanical Engineering 524. 2 1-hour periods, 1 2-hour period, 4 credits.

646. Deterministic and Stochastic Measurement
The dynamic analysis of instrumentation systems, the resulting dynamic measurement errors, measurement system synthesis for specified dynamic accuracy and methods of correcting data which has dynamic errors. Introduction to the description of stochastic processes. Fourier transforms, power spectral density and autocorrelation functions and their application to measurements on systems with random excitation. 4 credits.

691. Economic Decision Making in Engineering
The principles that form the basis for making engineering decisions to obtain the most favorable economic results. Prerequisite: senior standing. 4 credits.

695 a-d — 696 a-d. Mechanical Engineering Undergraduate Projects and Independent Study
Course numbers refer to topics in thermal science, solid mechanics, engineering design, and materials, respectively. 2-4 credits.

697-698. Mechanical Engineering Seminar
2-4 credits.

699. Undergraduate Thesis
2-4 credits.

701. Macroscopic Thermodynamics
A continuation of the study of thermodynamic principles using an analytical approach consistent with that of Gibbs and Caratheodory. 4 credits.

702. Statistical Thermodynamics
An introduction to statistical thermodynamics. 4 credits.

703. Heat Transfer
Analysis of heat transfer phenomena; steady-state and transient conduction, radiation, and convection; engineering applications. 4 credits.

704. Experimental Heat Transfer
Experimental methods in the study and solution of heat transfer problems, including a critical comparison with analytical and other methods. Literature surveys and written and oral presentation of results will be emphasized. 4 credits.

707. Analytical Fluid Dynamics
An analytical study of the dynamic behavior of fluids. Topics include potential flow, development of the Navier-Stokes equations, turbulence, and boundary layer theory. 4 credits.

708. Gas Dynamics
Basic equations of motion of one-dimensional, subsonic and supersonic flows of compressible, ideal fluids. Wave phenomena. Rankine-Hugoniot relations. Linear approach to two-dimensional flow problems. 4 credits.

715. Internal Combustion Engines
Application of basic and engineering science to the engineering problems of spark and compression ignition engines, design, management, and reporting of experimental studies. 4 credits.

716. Propulsion Systems
Application of basic and engineering sciences to the engineering problems of propulsion systems. 4 credits.

723. Advanced Dynamics
A traditional course in classical mechanics with an orientation to contemporary engineering applications. Review of particle dynamics. Hamilton's principle and the Lagrange equations. Kinematics and dynamics of rigid bodies, gyroscopic effects in machinery and space structures. 4 credits.

724. Introduction to Vibrations
The theory of discrete vibrating systems is treated in depth. Review of linear system concepts and detailed treatment of the single degree of freedom system with general excitation. Matrix theory and eigenvalue problems. Many degrees of freedom, normal mode theory for free and forced vibration. Numerical methods. Introduction to continuous systems. Applications are made both to structural and mechanical systems. 4 credits.

726. Experimental Mechanics
Experimental methods and their underlying theoretical bases are developed and applied to the measurement of stress, strain, and motion. 4 credits.

727. Advanced Mechanics of Solids
Advanced topics in the mechanics of solids are treated in depth; beams on elastic foundation, curved bars, inelastic behavior, instability, introduction to thin plates and shells, introduction to elasticity, energy methods, and numerical methods. 4 credits.

730. Mechanical Behavior of Materials
The elastic and inelastic behavior of materials, both organic and inorganic, is studied from a micromechanics and macromechanics point of view. Concepts of stress, strain, and constitutive relations are reviewed and related to recent developments in dislocation theory and other phenomena on the atomic scale and to continuum mechanics on the macroscopic scale. Mechanical behavior including elasticity, plasticity, viscoelasticity, creep, fracture, and damping will be treated. Anisotropic and heterogeneous materials such as composite materials will be studied in detail. 4 credits.

741. Control of Physical Systems
Theory and methods for modeling and evaluating fluidic, hydraulic, and pneumatic control systems. 4 credits.

742. Discontinuous Control
The analysis and synthesis of feedback control systems operating on quantized information; compensation and performance improvement methods which use the quantized nature of the information are also developed. 4 credits.

751. Naval Architecture
Hydrodynamic resistances of surface ships and submerged bodies; model testing theory; powering and propellers; use of standard series tests; introduction to ship motion, control steering, and rudders; concepts of ship design; computer application to problems. 4 credits.

761. Crystalline Solids
Theoretical and experimental studies of the structure of crystalline solids using X-ray diffraction techniques. 4 credits.

763. Microstructure of Solids
Theoretical and experimental studies of the microstructure of solids using optical and electron microscopy. 4 credits.

781. Mathematical Methods in Engineering Science — I
Mathematical methods in engineering sciences are discussed, including methods for solution of discrete and continuous systems. Course includes a review of calculus, linear algebra, complex numbers, Fourier series, differential and partial differential equations with examples from acoustics, vibration theory, hydrodynamics, elasticity, solid mechanics, transport theory, and particle mechanics. 4 credits.

793 a-d — 794 a-d. Special Topics in Engineering
Course numbers refer to topics in thermal science, solid mechanics, engineering design, and materials, respectively. Content of these courses may vary from year to year. 2-4 credits.

795 a-d — 796 a-d. Independent Study
Course numbers refer to topics in thermal science, solid mechanics, engineering design, and materials, respectively. 2-4 credits.

Microbiology (47)

Lawrence W. Slanetz, *Professor and Chairman*; Theodore G. Metcalf, *Professor;* Galen E. Jones, *Professor;* William Chesbro, *Professor;* Fred T. Hickson, *Assistant Professor*

501. Public Health and Sanitation
The nature and types of microbes which cause infectious diseases; the prevalence,

transmission, and control of these diseases. Sanitation of water, sewage, food, and air. Community hygiene and public health administration. Mr. Slanetz. Prerequisite: Biology 401, 402 or permission of instructor. 4 credits.

503. General Microbiology
Principles of microbiology; morphology, physiology, and classification of bacteria and other microorganisms, and their relationships to agriculture, industry, sanitation, and infectious diseases. Mr. Chesbro, Mr. Hickson and staff. Prerequisite: Chemistry 401-402 or equivalent. 2 lectures, 2 laboratories, 4 credits.

600. Environmental Microbiology
Relation of microorganisms to food production; food preservation; food infections and intoxications; standard laboratory methods for the bacteriological examination of foods. Microbiology and sanitation of milk, water, sewage, air, and eating utensils. Disinfection and disinfectants. Mr. Chesbro and Mr. Slanetz. Prerequisite: Microbiology 503. 2 lectures, 2 laboratories, 4 credits.

701. Advanced Microbiology
The growth, nutrition, and metabolism of microorganisms; consideration of cell structure and localization of function; aspects of genetic and non-genetic regulation of metabolism; study of the influence of chemical and physical factors of the environment upon microorganisms. Mr. Chesbro. Prerequisite: Microbiology 503. 2 lectures, 1 laboratory, 4 credits.

702. Pathogenic Microbiology
The morphological, cultural, biochemical, serological, and pathogenic characteristics of microorganisms causing human and animal diseases. Mr. Metcalf. Prerequisite: Microbiology 503. 2 lectures, 2 laboratories, 4 credits.

705. Immunology and Serology
The defensive elements possessed by man and animals which serve to protect them from infectious microorganisms. The principles of serological techniques used in the recognition and identification of biological materials including microorganisms. The preparation of vaccines and the production of antisera in animals. Mr. Metcalf. Prerequisite: Microbiology 702. 2 lectures, 2 laboratories, 4 credits.

706. Virology
The animal and plant viruses, including bacteriophages and the rickettsiae; a consideration of techniques for the propagation and recognition of animal viruses; a study of the interactions between virus and host cell and the application to problems of plant or animal infections caused by viruses. Mr. Metcalf. Prerequisite: Microbiology 702. 1 lecture, 3 laboratories, 4 credits.

707. Marine Microbiology
Characterization of microbes in the sea as to taxonomy, physiology, ecology, and transformation of carbon, nitrogen, sulfur, and phosphorus; methods of sampling and enumeration; biogeochemistry; properties of sea water and the marine environment. Parallels to soil microbiology will be drawn. Mr. Jones. Prerequisite: Microbiology 503 and biochemistry. 2 lectures, 1 laboratory, 4 credits.

761-762. Clinical Laboratory Methods
An 11-month course in medical technology taken at the Mary Hitchcock Memorial Hospital School of Medical Technology, Hanover, New Hampshire. This course starts about June 20, and includes lectures and laboratory work in bacteriology, blood bank and serology, clinical chemistry, hematology, laboratory management and ethics, mycology, parasitology, histology, and clinical microscopy. Credits will be allowed when the University has received a transcript of the candidate's record and upon certification by the Director of the School and the Supervisor of the Medical Technology curriculum that the work has been successfully completed. This course qualifies a candidate for the examination for

the Medical Technologist's Certificate administered by the Registry of Medical Technologists of the American Society of Clinical Pathologists. 32 credits. *This course cannot be taken for graduate credit.*

795, 796. Problems in Microbiology
Special problems, depending upon the training and desire of the student. Prerequisite: permission of department chairman and staff concerned. 4 credits.

797, 798. Microbiological Literature
Reports and discussions on current literature and recent developments in microbiology. Staff. Prerequisite: permission of instructor. 1 2-hour period, 2 credits.

Music

Keith Polk, *Assistant Professor and Chairman;* Karl H. Bratton, *Professor;* Donald E. Steele, *Professor;* Irving D. Bartley, *Associate Professor Emeritus;* Alan Grishman, *Associate Professor;* Peter Waring, *Associate Professor;* John Whitlock, *Associate Professor;* John Wicks, *Associate Professor;* Mark DeVoto, *Assistant Professor;* Stanley Hettinger, *Assistant Professor;* Wendell Orr, *Assistant Professor;* Ada-Louise Rogers, *Assistant Professor;* John Rogers, *Assistant Professor;* Paul Verrette, *Assistant Professor;* Howard Williams, *Assistant Professor;* and the following *Lecturers in Music:* Donald Bravo, Lynda Copeland, Frances Drinker, Ruth Edwards, Paul Gay, Nancy Hunziker, Meredyth Jones, Natalo Paella, Mary Rasmussen, Paul Ross, Richard Summers, Peter R. Sylvester.

History, Literature and Appreciation (63)

401. Introduction to Music
A fundamental approach to perceptive listening, based on a detailed study of several masterpieces representing different periods and forms. Historical perspective is utilized in cultivating the skill of listening, but the main emphasis is on confronting significant works of musical art on their own terms. Some participation in the musical life of the University community is also required. Not open to music majors. 4 credits.

402. Survey of Music History
A survey of the historical development of musical style in relation to the whole fabric of Western civilization. Prerequisite: Music 401. Not open to music majors. 4 credits.

501, 502. History and Literature of Music
An introduction to the styles, forms, and techniques of composition in Western music. Mr. Polk and Mr. DeVoto. Required of all music majors. 4 credits.

511. Survey of Music in America
The development of music in the United States from colonial times to the present, including the various European influences, the quest for an American style, and the emergence of such indigenous phenomena as jazz. Prerequisite: Music 401 or 501. 4 credits.

595. Special Topics in Music Literature
This course allows both music majors and non-majors to explore any of a variety of topics mutually agreed upon by students and instructor. The subjects will be in areas not easily covered in courses operating in the usual historical framework. Conferences and papers as required by the instructor in charge. May be repeated for credit. 4 credits.

695. Honors Program, Independent Undergraduate Study
An honors program involving two types of work: (1) The student pursues independent study in one or more specialized areas. (2) The student attends a seminar concerned with an area in which no appropriate course is offered in the under-

graduate curriculum. The student will be given an opportunity in the seminars to discuss his own research with members of the faculty and other participating students. Prerequisite: an average of 3.0 or show exceptional aptitude for music and permission of the instructor. 2 or 4 credits.

701. Music of the Medieval Period
The nature of the beginnings of polyphony. The pre-eminent influence of the church in the Thirteenth Century and the rising secular movement in the Fourteenth. Music as a dominant force in the political and social life of the Middle Ages. Prerequisite: permission of the instructor. Mr. Wicks. 4 credits.

703. Music of the Renaissance
A study of the works of the composers of the Fifteenth and Sixteenth Centuries from Dunstable to Palestrina. Prerequisite: permission of the instructor. Mr. Wicks. 4 credits.

705. Music of the Baroque
A study of the music of Europe from Derore to Handel. Particular attention is given to the profusion of styles and forms in the Seventeenth Century. Prerequisite: permission of the instructor. Mr. Wicks. 4 credits. (Not offered in 1969-70.)

707. Music of the Classical Period
The growth of musical styles and forms from early classical, Baroque-influenced composers, through the high classicism of Haydn and Mozart, to the budding romanticism of the young Beethoven. The class will hear representative works in the areas of symphony, concerto, and opera. Mr. Grishman. 4 credits.

709. Music of the Romantic Period
The symphonies, concerti, chamber music, and keyboard works of Beethoven, Berlioz, Schubert, Mendelssohn, Schumann, Brahms, Franck, Chopin, and Liszt. Romantic elements contained in the development of harmony orchestration, sonority, expressive content. The rise of the short piano piece, the German art song, the symphonic poem, nationalism in music. Mr. Steele. 4 credits.

711. Music of the Twentieth Century
Music of the Twentieth Century, including its literature, its trends, and an analysis of techniques, styles, forms, and expression. 4 credits.

721. The Life and Works of Beethoven
The piano sonatas, the concerti, symphonies and string quartets. Lectures, analysis, reports, required readings and listening. 4 credits.

731. The Lied
Study of the history and literature of the German art-song, with special emphasis on the Nineteenth and early Twentieth Centuries. Prerequisite: permission of the instructor. 4 credits.

732. The Art Song
This course will emphasize the non-German song of the late Nineteenth and Twentieth Centuries. Prerequisite: permission of the instructor. 4 credits.

733. Survey of Opera
An investigation of representative masterpieces of this art form through listening, reading, and discussion. Mr. DeVoto. 4 credits.

734. Survey of Oratorio
This course attempts to place the oratorio in clear historical perspective in relation to other forms of church music as well as opera. Mr. Wicks. 4 credits. (Not offered in 1969-70.)

735, 736. Survey of Pianoforte Literature
The history and development of keyboard literature from Bach to the present. A discussion and performance of the works of Bach, the sonatas and concertos of Haydn, Mozart, Beethoven, Schubert, the Romantic composers, and of contemporary writers. Mr. Steele. 4 credits.

795. Special Studies in Music Literature
Presuming a sound musical background, this course allows the student to investigate independently and in depth any of a vast range of subjects. Barring duplication of material, this course may be repeated for credit. Prerequisite: permission of the instructor. 4 credits.

Performance (63)

Registration for musical organization courses should be completed during the registration period. All music laboratory courses may be repeated. A maximum of 8 credits earned in music laboratory may be used toward graduation.
Private lessons are based on half-hour individual instruction per week. One semester hour credit may be earned with one lesson per week; two or four semester hours of credit may be earned with two lessons per week (only students in the Bachelor of Music curriculum are allowed to register for four credits). Five one-hour practice periods are expected for each credit of private study. The special semester fee for lessons is $25 per half-hour lessons (this fee applies for courses numbered 541 through 559). The fee includes the use of a practice room for the required preparation. Majors in performance study in the Bachelor of Arts curriculum are required to present 16 semester hours of private study over a period of four years. Two lessons per week are required each semester. Four semester credits taken in the freshman year are regarded as prerequisite to the performance option.
Registration in courses of private instruction is open to all students in the University, subject to approval by the instructor who will determine the course level. A student may register for credit in successive semesters.

441, (441). Concert Choir — Techniques and Literature
A choral group devoted to study and performance of the best classical and modern choral literature. Recommended for men and women voice majors. Open to all interested students. Mr. Bratton. Prerequisite: permission of instructor. 2 laboratories, 1 credit.

442, (442). Repertory Chorus
A mixed chorus which studies and performs sacred and secular works from the Renaissance to the present. The chorus participates from time to time with the opera workshop and with the orchestra, and serves as a nucleus for larger choral-instrumental works. Mr. Waring. Prerequisite: permission of the instructor. 2 laboratories, 1 credit.

443, (443). Women's Glee Club
Open to all students interested in singing the finest literature in this medium and who can fulfill the requirements of a tryout. Recommended for all women voice majors. Prerequisite: permission of the instructor. 2 laboratories, 1 credit. NLG.

444, (444). The Newhampshiremen
The male chorus of the University. Open to all students interested in singing the finest of literature in this medium and who fulfill the requirements of a tryout. Recommended for all men voice majors. Mr. Orr. Prerequisite: permission of instructor. 2 laboratories, 1 credit. NLG,

445. Summer Session Chorus and Basic Conducting
A choral group devoted to the study and performance of the best classical and modern choral literature. The basic elements of choral conducting, for elementary and secondary teachers, church choir directors, and those interested in singing. 1 credit. (Special Summer Session course which may be repeated.)

448, (448). Opera Workshop
Experience in operatic singing, acting, and production techniques is offered through performance of both complete operas and operatic excerpts. Mr. Orr. Prerequisite: permission of instructor. 1 credit.

450, (450). University of New Hampshire Symphony — Techniques and Literature
The orchestra, open to all students on the basis of individual auditions, presents several concerts during the year of repertoire ranging from the great standard symphonic literature to experimental multi-media compositions. Prerequisite: permission of the conductor. 2 laboratories, 1 credit. Mr. Grishman.

451, (451). University of New Hampshire Training Orchestra
The training orchestra is designed for music education majors but is open to all who wish to develop instrumental proficiency on their major or secondary instruments. The course provides ensemble experience in the basic repertoire often met in school situations for students who do not yet meet the standards required for participation in the UNH Symphony. 2 laboratories, 1 credit.

452. University of New Hampshire Symphonic Wind Ensemble
The Wind Ensemble studies and performs the finest in wind instrument literature and is open to all students on the basis of audition. Performances include campus concerts and tour appearances throughout New England. Mr. Hettinger. Prerequisite: permission of instructor. 4 laboratories, 1 credit.

453. University Band
The University Band repertoire is chosen from the standard band literature and includes original band music, transcriptions, marches, etc. The University Band functions as a musical outlet for those students whose schedule or interest does not permit music as a major interest, but are interested in maintaining their playing proficiency and continuing their study of music. Mr. Hettinger. Prerequisite: permission of instructor. 2 laboratories, 1 credit.

454. University of New Hampshire Marching Band
The Marching Band is open to all students and performs during the football season at home and away games. Rehearsals of the Marching Band conclude at the end of the football season. Prerequisite: permission of instructor. Students planning to remain in the band program at the conclusion of the football season should register for Music 452 or 453. 4 laboratories, 0 credit.

455, (455). Piano Ensemble — Techniques and Literature
A laboratory course in ensemble playing and accompaniment. Drawing from available student instrumentalists and singers, the pianist learns the art of performing in trios, duo sonatas, two-piano works, and gains experience in Lieder accompaniment. 1 credit.

456, (456). String Ensemble — Techniques and Literature
457, (457). Woodwind Ensemble Techniques and Literature
458, (458). Brass Ensemble — Techniques and Literature
In these courses small groups of performers are organized in order that more advanced students may gain experience in chamber music performance and literature. Prerequisite: permission of instructor. 1 credit.

465, (465). Group Voice Class for Beginners
To develop the basic fundamentals in voice production, such as breathing, phrasing, pure tone, resonance, posture, and the study of vocal literature through group activity with some of the finest work of the masters. A basic knowledge of the piano keyboard and ear training is necessary. Mr. Bratton. Permission of instructor. 2 credits.

467, 468. Functional Piano Class
Piano instruction primarily for beginning students in a class. Training in the following subjects will constitute the course: pianoforte techniques and reading of music; keyboard harmony geared to the practical harmonization of grade school melodies; transposition; sight reading; improvisation. Beginning stu-

dents in music education curriculum may take this course for 1 semester. Enrollment limited to 8. Permission of instructor. 2 credits.

541, (541). Voice
Instruction in voice will seek to develop those qualities which are essential for intelligent interpretation, such as correct posture, breathing, pure tone, resonance, clear enunciation, and technical facility. Each voice is given the treatment best suited to its individual needs. A higher ideal than the perfection of mere mechanical skill is sought, namely a musical style of singing and a thorough appreciation of the best works of the masters, both classic and modern. Mr. Bratton, Mr. Orr, Mrs. Jones, and Miss Hunziker. Permission of instructor. 1 or 2 lessons, 1, 2, or 4 credits.

542, (542). Piano
The methods of presentation and the material used vary with each pupil and his degree of advancement. With beginners, training is given in the fundamentals of pianoforte technique and in the reading of keyboard music. As early as is practicable, emphasis is placed on musical values, musicianship, and sound piano technique. For this purpose, the literature employed is selected from the masters. Musical understanding is developed and quality of performance is stressed. With the attainment of advanced technique, the student's repertory is broadened to include works of all periods of literature. Mr. Steele, Mrs. Rogers, Mr. Wicks, Mr. Verrette, Mr. Waring, Mrs. Edwards. Permission of instructor. 1 or 2 lessons. 1, 2, or 4 credits.

543, (543). Harpsichord
Weekly private instruction on the Adams harpsichord, the lesson covering harpsichord technique and early keyboard repertoire, with emphasis on keyboard practices of the Eighteenth Century. Mrs. Copeland, Mr. Wicks. 1 or 2 lessons, 1, 2, or 4 credits.

544, (544). Organ
Thorough training in the fundamentals of manual and pedal technique primarily through a graded approach to baroque and modern organ compositions. In addition to scheduled lessons organ students will meet each week as a class: (a) to perform pieces from their current repertoires and (b) to participate in a survey of organ literature. Advanced students will also receive training in service playing, improvisation, and figured bass realization. Permission of the instructor. Mrs. Copeland, Mr. Wicks, Mr. Waring. Minors attending performance class only, 1 credit. Students attending both performance and survey sessions, 2 to 4 credits.

555, (555). Violin, Viola
Students receive a thorough technical foundation on the violin or viola with emphasis on musicianship and musical values. The choice of literature, drawn from the great instrumental repertoire, will depend on the individual student's background and ability. Prior experience is a prerequisite. Mr. Grishman. Permission of the instructor. 1 or 2 lessons, 1, 2, or 4 credits.

556, (556). Violoncello; String Bass
Objectives are based primarily on the student's ability and experience. A general awareness of the instrument as regards technique and tone are the first essential prerequisites. These elements will gradually broaden to include the attention and cultivation of the student's musical perception and repertoire. Mr. Ross. Permission of instructor. 1 or 2 lessons, 1, 2, or 4 credits.

557, (557). Woodwind
Instruction in the technique and literature for the flute, oboe, clarinet, bassoon, and saxophone. Ability and previous background determines a student's course of study. Competence in basic fundamentals of tone production, embouchure, articulation, and phrasing lead to concentration in the solo and chamber

music repertoire for each instrument. The development of sound musicianship through study of music representative of all periods and styles is stressed. At least one public solo performance each semester is required. Mr. Bravo, Mrs. Drinker, Mr. Hettinger, Mr. Summers. 1 or 2 lessons, 1, 2, or 4 credits.

558, (558). Brass
Instruction in any of the following instruments: trumpet, trombone, French horn, baritone, and tuba, or any brass instrument. Correct tone production, articulation, and musical interpretation are stressed. Mr. Gay, Mr. Paella, Mr. Polk, Miss Rasmussen, Mr. Rogers. Permission of instructor. 1 or 2 lesson. 1, 2, or 4 credits.

559, (559). Percussion
Snare drum rudiments. The technique, tuning, and sticking of the timpani. Cymbals and all other percussion effects (claves, maracas, triangle, tambourine, wood-block, chimes, etc.), glockenspiel, bells, or bell lyre, as well as xylophone. Mr. Whitlock, Mr. Sylvester. Permission of instructor. 1, 2 or 4 credits.

755, (755). Performance Studies in Medieval Music
An investigation of music for vocal, vocal-instrumental and instrumental ensemble, circa 1100 to 1450, and its realization in performance, especially with regard to rhythm, *musica ficta,* notation, melodic ornamentation, improvised polyphony, and the clear projection of a polyphonic texture. Course work includes an evaluation of the writings of selected Medieval theorists and modern scholars; practical exercises in transcription; and performance on reconstructions of Medieval instruments, especially the organ, harp, psaltery, rebec, vielle, and recorder. Mr. Polk. 2 or 4 credits.

756, (756). Performance Studies in Renaissance Music
An approach to the problems of musical performance, circa 1450 to 1600, via the small vocal, vocal-instrumental and instrumental ensemble, with special reference to rhythm and tempo, *musica ficta,* text underlay, articulation, diminution, tablature notation, and effective distribution of voices and instruments. Course work includes a survey of performance manuals, iconographical sources and current research; development of editing technique through the preparation of transcriptions; and an opportunity to perform on representative musical instruments of the period, notably the organ, harpsichord, lute, viols, recorders, cornetto, and trombones. Mr. Polk, Miss Rasmussen. 2 or 4 credits.

757, (757). Performance Studies in Baroque Music
A study of performance practices in solo keyboard works, sonatas *a 2* and *a 3* and solo cantatas, circa 1640 to 1750, concentrating on ornamentation, realization of figured basses, improvisation, articulation, rhythm, keyboard registration, and the influence of the construction of baroque musical instruments (including the organ) on sonority and technique. Course work includes an examination of manuscripts (on microfilm), prints, treatises and iconographical sources and the editing and realization of selected works for recital performance. Miss Rasmussen, Mr. Wicks. 2 or 4 credits.

758, (758). Performance Studies in Classical Music
An intensive examination of musical styles, circa 1760 to 1815, through the performance of keyboard music and instrumental chamber music, emphasizing the relationship between structure and interpretation, late Eighteenth Century conventions of ornamentation and articulation, a survey or tutors and relevant theoretical writings, and a critique of currently published editions and editing techniques. Mr. Grishman, Miss Rasmussen. 2 or 4 credits.

759, (759). Performance Studies in Nineteenth-Century Music
The art of performing and coaching *Lieder,* piano music, and instrumental

chamber music from Schubert through Debussy, with special consideration given to effective ensemble, traditions of interpretation, and the influence of structure on performance. Mr. Steele, Mr. Grishman. 2 or 4 credits.

760, (760). Performance Studies in Twentieth-Century Music
Performance of representative Twentieth Century compositions for small instrumental or vocal-instrumenal ensemble, with intensive work in structural analysis, rhythmic ensemble coordination, dynamic and articulation control, new instrumental techniques, notation, improvisation, and the interaction between jazz and European styles. Mr. Polk, Mr. Rogers, Mr. Verrette. 2 or 4 credits.

Theory and Composition (63)

471-472. Theory I
A composite course in theory consisting of sightsinging, ear training, dictation, and elementary harmony, both written and keyboard. Basic knowledge of the piano is necessary. Basic techniques in harmonization in four parts of soprano melodies, and basses (figured and unfigured), using triads and their inversions, and secondary dominants. Attention will also be given to harmonic rhythm, modulation, and analysis. Mrs. Rogers, Mr. Waring, Mr. Williams. 4 credits.

571-572. Theory II
A creative approach to advanced harmony through part-writing and analysis. Included is advanced study in sightsinging, ear training, and dictation. Mr. Wicks and Mr. Rogers. Prerequisite: Music 471-472 or its equivalent. 4 credits.

575-576. Conducting Methods
The development of conducting — physical aspects, equipment of conductor, fundamental gestures and beats, baton techniques. The reading and analysis of full and condensed scores, study of transposition, psychology of rehearsal. Mr. Hettinger. Prerequisite: Music 571-572 and junior standing. 2 credits.

771-772. Counterpoint
First semester: Polyphony in two to four voices based on the linear, harmonic, and rhythmic techniques of Sixteenth Cenury vocal music. Work in species and imitative forms as exemplified by Polestrina. Second semester: Tonal counterpoint based on Eighteenth Century style. Various exercises in two to four voices referring to keyboard and instrumental examples of Bach and Handel. Mr. Rogers. Prerequisite: Music 571-572 or permission of the instructor. 2 credits.

773-774. Canon and Fugue
Continuation of studies in tonal counterpoint. Construction of canons and 2-, 3-, and 4-voice fugues based on the keyboard and instrumental style of Bach. Mr. Williams. Prerequisite: Music 771-772 or permission of the instructor. 2 credits.

775-776. Composition
Consideration of simple phrase structures, binary and ternary forms as exemplified in classic sonata movements, theme and variations and textsettings as basic models for the uniting of specific composition projects. Mr. Williams. Prerequisite: permission of instructor. 2 credits,

777-778. Advanced Composition
Composition projects of the student, unlimited in scope and nature and reflecting the student's compositional interests. Guidance and advice of the instructor as appropriate to each individual project. Mr. Williams. Prerequisite: permission of the instructor. 4 credits.

779. Orchestration
The characteristics of band and orchestral instruments both individually and in small (homogeneous) and large (mixed) groupings. Students will be expected to study appropriate scores, to write arrangements utilizing these vari-

ous groupings, and to have these arrangements performed if at all possible. Some aspects of vocal writing will also be covered. Mr. Rogers. Prerequisite: permission of the instructor. 4 credits.

781. Form and Analysis
A consideration of various formal and textural elements both as concepts and within the context of musical examples. Thorough analysis of smaller and larger masterworks from the standpoint of harmony, counterpoint, structural line and formal articulation. Mr. DeVoto. Prerequisite: permission of the instructor. 4 credits.

Music Education (64)

595. Special Projects in Music Education
A course to allow an undergraduate to undertake individual investigation, research, or study in any aspect of music education in which he has particular need or interest. Projects of a creative nature may be included. Mr. Whitlock. Prerequisite: permission of instructor. 2-4 credits.

741-742. Techniques and Methods in Choral Music
A lecture-workshop course concerning problems in the organization and performance of high school, college, and community choruses. Emphasis is placed on techniques of choral conducting and rehearsal, repertory, and materials. Mr. Bratton. 2 credits.

743. Materials and Methods in Piano Music
A course designed to give potential piano teachers a coherent but flexible approach to the instruction of students of different ages and levels of talent through evaluation of methods and materials and discussion of the role of the private teacher. Mrs. Edwards. 2 credits.

745-746. Techniques and Methods in String Instruments
Class and individual instruction on stringed instruments, students are expected to practice four hours per week as a basic course requirement. A high level of instrumental proficiency results from intensive training on the violin, viola, cello, and double bass, enabling participants to perform in string ensembles. The course will explore classroom procedures, the establishment of string programs, and the evaluation of available methods materials. Mr. Grishman. 2 credits.

747-748. Techniques and Methods in Woodwind Instruments
Basic fundamentals of performance in woodwind instruments, techniques of class instruction, associated acoustical problems, and study of woodwind literature. Emphasis in the first semester will be on clarinet, flute, and saxophone. The double reed instruments will be emphasized in the second semester. Mr. Hettinger. 2 credits.

749-750. Techniques and Methods in Brass Instruments
A basic course in embouchure formation, tone, tonguing, fingering, flexibility, accuracy and range development as applied to the trumpet or baritone horn, French horn, and trombone, in conjunction with a survey of the methods, studies, solos, and ensembles most likely to be useful with grade school, junior high school, and high school players of brass instruments. Qualified, advanced students may elect honors work in composition, arranging, and ensemble coaching. Miss Rasmussen. 2 credits.

751. Techniques and Methods in Percussion Instruments
The basic skills necessary for performance on snare drum, tympani, mallet instruments, and the other percussion instruments used in bands and orchestras. Materials and methods of instruction are included. Mr. Whitlock. 2 credits.

785. Music for the Elementary Classroom Teacher
For the non-specialist interested in utilizing music in the classroom. The correlation and integration of music in the school curriculum, and the basic skills and techniques necessary. Mr. Whitlock. 4 credits.

787. Problems in the Teaching of Elementary School Music
Aims, scope, and organization of materials and activities in the elementary schools. Modern trends in educational philosophy, development of the child's voice, and demonstration of materials and methods for the various grades. Observation and teaching in schools. Mr. Whitlock. 2-hour seminar, 3-hour laboratory, 2 credits.

791. Problems in the Teaching of Secondary School Music
The application of educational principles to the teaching and learning of music and the organization of the music curriculum on the junior and senior high school levels. The adolescent voice, the classification of voices, the selection of vocal and instrumental materials, and the building of unified concert programs. Problems of administration, management, and the relationship of the teacher to school and community. Observation of music programs in secondary schools. Mr. Whitlock. 4 credits.

Nursing

Mary Louise Fernald, *Associate Professor and Chairman;* Marguerite Fogg, *Associate Professor;* Elizabeth A. Burtt, *Assistant Professor;* Caroline Davies, *Assistant Professor;* Diane Ihra, *Assistant Professor;* Ann M. Kelley, *Assistant Professor;* Joan Collins, *Instructor;* Elizabeth Hiltunen, *Instructor;* Sandra J. Plummer, *Instructor*

401-402. Orientation to Professional Nursing
Freshmen students of nursing are required to meet in groups with faculty on a regular basis for orientation to professional nursing. 0 credit.

503-504. Fundamentals of Nursing
This course is designed to assist the student in developing beginning knowledge, skills, and understanding of nursing. The focus is to acquaint the student with nursing actions aimed at the communicative, personal hygiene, safety, and comfort needs of people. The laboratories are experiences in hospitals and other health agencies designed to guide the student in planning and carrying out nursing care of people. Mrs. Kelley. 4 credits.

551. Medical-Surgical Nursing
The major health problems of people as alterations in their ability to maintain normal body functions. The scientific method is employed in examining the needs of the individual person and establishing a basis for nursing action. The student is provided with an opportunity to give nursing care to adult patients in a community hospital and to become involved with a variety of health services. Mrs. Hiltunen. Prerequisite: Nursing 504. 4 credits.

602. Maternal and Child Nursing and Community Health Nursing
Designed to provide the student with the opportunity to gain new knowledge and skill as well as adapting previous learning in giving total family health care. A broad focus enables the student to demonstrate personal and professional responsibility in a relationship with individuals, families, and communities. Nursing laboratory experiences are provided, using local hospitals, a medical center, community health agencies, and other health facilities. Miss Fogg, Miss Burtt. Prerequisite: Nursing 551. 16 credits.

621. Acutely Ill Patient and Psychiatric Mental Health Nursing
A continuation of the emphasis described in Nursing 602. Mrs. Ihra, Miss Collins. Prerequisite: Nursing 551. 16 credits.

702. Senior Nursing
Senior nursing provides an opportunity for the student to adapt and build upon previous knowledge, understanding, and skill in order to demonstrate competency in personal and professional nursing responsibilities. A broad approach enables the student to develop self-awareness, ability to function as a leader, understand group dynamics, and an understanding of beginning research. Miss Davies. Prerequisite: Nursing 602 and 621. 8 credits.

Occupational Therapy (65)

R. Virginia Bell, *Assistant Professor and Chairman*; Laurel G. Bunker, *Assistant Professor*; Julia Lowe Burrows, *Instructor*; Mrs. Kathryn M. Whitman, *Pre-Clinical Instructor*; MEDICAL LECTURERS: William Amman, M.D., *Ear, Nose, Throat Conditions*; Arthur DiMambro, M.D., *Orthopedics*; Charles H. Howarth, M.D., *General Medicine and Surgery*; Gerald Shattuck, M.D., *Pediatrics*
The following courses are for occupational therapy students; elective for others by permission of the department chairman.

300. Exploration of Occupational Therapy
A broad survey of occupational therapy as a service-oriented health profession. The educational requirements, the responsibilities and goals, the satisfactions and opportunities. The curriculum will be explored by review of television tapes made by occupational therapy students. Visits to local occupational therapy departments, films, and guest speakers. Mrs. Whitman. 0 credit.

411. Occupational Therapy Theory I
Developmental concepts and historical perspectives of the basic theories and techniques of occupational therapy. The fundamentals of evaluation, testing, and problem solving; the central role of the patient in planning and administering treatment. Lecture presentations are correlated with clinical observation and supervised clinical participation. Mrs. Burrows and staff. 4 lectures, 2 laboratories, 4 credits.

412. Needlecraft
Basic instructions in sewing, needlecrafts, knitting, and crocheting. The application of needlework as a therapeutic media and/or recreational program in chronic hospitals, and those aspects of needlecraft pertinent to the administration of ancillary personnel in this area. Mrs. Burrows. Prerequisite: Permission of instructor. 2 laboratories, 2 credits.

515. Treatment Media I — Crafts
An introduction to craft techniques in selected basic activities, including printing, leather work, and ceramics. The analysis of crafts in relation to their potential as treatment tools. Methods of teaching basic procedures and skills to patients. Minimum laboratory fee, $12.00. Staff. Prerequisite: Occupational Therapy 411. 2 laboratories, 4 credits.

520. Treatment Media II
A methods and skills course basic to work with patients in the fields of pediatrics, geriatrics, physical disabilities, general medicine, surgery, and rehabilitation. Developmental activities, activities of daily living, splinting, and adaptive device construction. This course is to be taken concurrently with Occupational Therapy 584 and 526. Fee for materials. Staff. Prerequisite: Occupational Therapy 411. 4 credits.

524. Occupational Therapy Theory II — Psycho-Social Treatment Methods
The application of psychiatry and psychology to the practice of occupational therapy with psycho-socially disabled pa-

tients. Learning theory, group dynamics, treatment, and rehabilitation techniques. Application of theory and training in evaluative techniques is presented and practiced in the clinical setting. Mrs. Burrows and hospital clinical staff. Prerequisite: Occupational Therapy 583. 4 credits.

526. Occupational Therapy Theory III — Physical Dysfunction
Basic evaluation and training methods for patients with physical disabilities. These include techniques of joint measurement, muscle testing, perceptual motor development, work tolerance and prevocational testing. Methods for developing coordination and improvement of neuromuscular patterns of movement. The importance of providing the patient a wholesome psychological climate conducive to recovery is stressed. This course is to be taken concurrently with Occupational Therapy 520 and 584. Miss Bunker. Prerequisite: Physical Education for Men 652 and Occupational Therapy 411. 4 credits.

583. Medical Lectures I — Psychiatry
Clinical psychiatric conditions presented by a psychiatrist. Both adult and childhood disabilities are discussed with patient presentations when possible. Recitations review and stress those aspects of the material most important in Occupational Therapy practice. The course is offered for 4 credits instead of 2 credits when in addition to the above material the student is involved in a sensitivity group training situation. Prerequisite: child development and psychology 545. 2-4 credits.

584. Medical Lectures II — Physical Dysfunctions
Lecture and clinical presentation of selected medical conditions of primary concern to the occupational therapist. Consideration is given to the etiology, pathology, symptoms, prognosis, and treatment of general medial and surgical conditions, pediatric conditions; and orthopedic and neurological conditions. This course is to be taken concurrently with Occupational Therapy 520 and 526. Drs. Charles C. Howarth, William Amman, Gerald Shattuck, and Arthur DiMambro. Prerequisite: Zoology 508 and medical terminology. 6 credits.

627. Occupational Therapy Theory IV — Advanced Physical Dysfunction
Muscle reeducation techniques used in treating patients with orthopedic and neurological disabilities. Cerebral palsy, polio, amputees, muscular dystrophy, spinal cord injuries, and degenerative neurological conditions are presented and discussed, as are the basic principals of the application of therapeutic exercises, prosthetic training, and the facilitation techniques of Bobath, Rood, Knott, Brunnstrom, and Fay. Miss Bunker. Prerequisite: Neurology, Occupational Therapy 526 and 584. 4 credits.

698. Senior Seminar
A two-semester discussional seminar which will consider topics including senior thesis, research methods, supervisory and consultive functions of the OTR, community practice, professional relationships, administrative procedures, and selected current professional issues. Miss Bell and staff. Prerequisite: senior standing in the major. 4 credits.

Philosophy (66)

Robert P. Sylvester, *Associate Professor and Chairman*; Donald C. Babcock, *Professor Emeritus;* Asher Moore, *Professor;* Duane Whittier, *Associate Professor;* Paul Brockelman, *Assistant Professor;* R. V. Dusek, *Instructor;* Frank Birmingham, *Instructor*

405. The Philosophic Dimension
The effort of the course is to give the individual student the authentic philosophic experience. Under critical guidance, students are encouraged to reflect

on their own experience and to compare their thinking with the ideas of others. Small workshops will meet twice a week with specially chosen upperclass students; participation in these workshops is expected of all students. There will be one lecture a week to the entire class. Quizzes, short papers, and write-at-home essays will be required in the workshops, and each student will keep a philosophical journal reflecting his principal concerns. Students will be evaluated on their progress in clear, honest, and comprehensive self-reflection and on their willingness to confront the ideas of others. 4 credits. NLG.

410. Introduction to Philosophy
An examination of representative philosophies and of some of the persistent problems of philosophy. An introductory course designed to acquaint the student with the nature of philosophy and to help him think about his experience philosophically. Open to all students. 4 credits.

412. Logic
An introduction to the principles of good reasoning, including practice in their application. The correct use of language, the logical structure of arguments, the detection of fallacies in reasoning, and the nature of scientific method. Open to all students. 4 credits.

480. Logic and Scientific Method
An introductory course in inductive logic and scientific method. Special attention will be given to problems in methodology and the foundations of the empirical sciences. The course is especially suggested for students who are familiar with elementary mathematics (algebra, calculus, or Mathematics 420. 4 credits.

500-501. History of Philosophy
The history of Western philosophy through the study of the major figures and movements from the early Greek philosophers to the Nineteenth Century. 4 credits. Students who are interested in advanced work in philosophy should take Philosophy 500-501 as early as possible. This course is not ordinarily open to freshmen, but freshmen who expect to major in philosophy or who intend to take advanced work in philosophy may elect the course by securing the permission of the instructor. Students who wish to register for Philosophy 501 without having taken Philosophy 500 must secure the permission of the instructor.

502. Mediaeval Philosophy
The philosophic thought of the Middle Ages from Augustine to Scotus but with particular emphasis upon the writing of St. Augustine and St. Thomas Aquinas. Prerequisite: Philosophy 500 or permission of instructor. Not open to freshmen. 4 credits. (Alternate years.)

503. Nineteenth Century Philosophy: Idealism, Materialism, Existentialism
The development of German philosophy from Kantian transcendentalism to dialectical absolutism: Kant, Fichte, Schelling, Schopenhauer, Hegel. The religious, existential, and economic reactions to Hegelianism: Kierkegaard, Nietzsche, Marx. Prerequisite: Philosophy 501. 4 credits.

504. Nineteenth Century Philosophy: Phenomenalism and Naturalism
An historical survey of concepts in Nineteenth Century epistemology of science and history. Emphasis will be placed on major figures in England and on the Continent. Readings from major thinkers such as John Stuart Mill, Compte, Mach, Darwin, Bergson, and the neo-Kantians should be expected. Others studied might include Duhen, Poincare, Frege, Dilthey, Marx and Engels. Prerequisite: Philosophy 500-501. Required for philosophy majors who plan to do graduate work. 4 credits.

510. Philosophy of Religion
A philosophical study of the nature and significance of religious experience, with historical and systematic analysis of such

traditional problems of philosophical theology as faith and reason, evil and the existence of God. A part of this course will consist of an intensive phenomenological study of the religious experience and an attempt to deal with the traditional problems from this point of view. Mr. Brockelman. Not open to freshmen. 4 credits.

521. Philosophy and The Arts
A consideration of contemporary works of literature, music, theatre, film, and the plastic arts in an attempt to elicit those philosophic concerns and perspectives which dominate the present. Attention will be given to social discontent, to the impact of science and technology, and to the search for authentic personal existence. Intensive use will be made of the cultural resources of the University and the region, so there will be some expense involved. Open to all students. Mr. Moore. 4 credits.

522. Philosophy of Art
The nature of art; the nature of creation and appreciation; the art media; judgments of worth; the relation of expression, form, and subject; the relevance of aesthetic experience to the larger philosophical picture. Prerequisite: Philosophy 521 or other evidence of adequate experience of at least two of the arts. 4 credits.

530. Ethical Theories
The problems of moral philosophy through the critical examination of important traditional and contemporary theories of ethics. Mr. Sylvester. Not open to freshmen. 4 credits.

535. Social and Political Philosophy
An examination of the distinctively philosophical problems encountered in social and political philosophy through the study of representative figures in the history of this branch of philosophy. An essential aim of this course will be to bring the student to serious and intensive reflection upon his own social and political philosophy. Mr. Sylvester. Not open to freshmen. 4 credits.

550. Symbolic Logic
The principles and techniques of modern logic, with special attention to their philosophic significance. Discussion of sentential calculus, class calculus, truth tables, and lower functional calculus as well as the nature of deductive systems and the problems of formal consistency. Prerequisite: Philosophy 400 or permission of the instructor. 4 credits.

595. Tutorial Reading
Reading of selected books under the direction and guidance of a member of the Department of Philosophy. The books offered for tutorial reading may be in any area the instructor chooses. Offered for second semester freshmen and sophomores. One hour conference with the instructor per week. 4 credits.

600. Philosophy Through Literature
The philosophical implications of representative literary works with particular emphasis on recent and contemporary literature. 3 lectures, 4 credits. (Alternate years.)

610. Analytic Philosophy
Its roots in the Nineteenth Century, its relation to science, and its development to the present day. The application of the analytic method to the solution of philosophic problems. Readings from such recent and contemporary figures as Russell, Wittgenstein, Ayer, Carnap, and Ryle. Prerequisite: Philosophy 500-501. 4 credits. (Alternate years.)

615. Contemporary Movements in Philosophy
Contemporary pragmatism, neo-realism and naturalism, with their roots in Nineteenth Century American philosophy. Readings from such recent and contemporary figures as Peirce, James, Dewey, Santayana, Whitehead, and C. I. Lewis. Prerequisite: Philosophy 500-501. 4 credits.

620. Existentialism
Its roots in the Nineteenth Century, its relation of phenomenology, and its development to the present day. Readings from such recent and contemporary figures as Sarte, Marcel, Heidegger, and Jaspers. Prerequisite: Philosophy 500-501. 4 credits. (Alternate years.)

630. Philosophy of Science
A discussion of various philosophical problems raised by science. For example, induction and probability, the nature of law, the significance of statistical techniques, the purpose and general principles of experimental design, theory construction, operationism, the nature of mathematics and its application in science, the place of speculation in science, the unity of science, special problems of the biological and social sciences. The relation of science to ethics, the humanities, and everyday life. 4 credits. (Alternate years.)

650. Problems in Philosophy
A systematic study of traditional problems in philosophy. Topics such as metaphysics epistemology, philosophy of mind, philosophy of history, philosophy of logic, and the like may be offered in this category. Since the course covers one systematic area the semester it is offered, a student may repeat the course as long as the topic offered is one he has not already taken for credit. Prerequisite: Philosophy 500-501 or consent of the instructor. 4 credits.

700, (700). Studies in the History of Philosophy
Intensive study of individual philosophers, important movements, schools, or periods in the history of philosophy. Subjects and instructors to be announced each year. Prerequisite: Philosophy 500-501. Lectures, lectures-discussion, or seminar. 4 credits. Barring duplication of subject, this course may be repeated for credit.

701. Topics in Systematic Philosophy
Intensive study of selected problems of philosophy in such areas as epistemology, metaphysics, and theory of value. Topics and instructors to be announced each year. Prerequisite: Philosophy 500-501. Lectures, lectures-discussion, or seminar. 4 credits. Barring duplication of subject, this course may be repeated for credit.

795, 796. Individual Study
Students who are adequately prepared to do independent work involving extensive reading and writing may do advanced work on an individual basis. Before registering for this course the student must formulate a project and secure the consent of a member of the department who will supervise his work. Conferences and/or written work as required by the supervisor. Seniors may write the senior paper for credit under this course offering. Credits to be arranged.

Physical Education for Men (90)

Gavin H. Carter, *Associate Professor and Chairman;* Robert E. Wear, *Associate Professor;* Walter E. Weiland, *Assistant Professor;* Robert Kertzer, *Assistant Professor;* Charles G. Arnold, *Assistant Professor;* Thomas Barstow, *Assistant Professor;* Louis Datilio, *Instructor.*

Faculty from the Department of Intercollegiate Athletics: Andrew T. Mooradian, *Director of Athletics;* Paul C. Sweet, *Professor;* Dwight Aultman, *Assistant Professor;* Lionel J. Carbonneau, *Assistant Professor;* Theodore W. Conner, *Assistant Professor;* F. William Haubrich, *Assistant Professor;* Irvin Hess, *Assistant Professor;* James F. Root, *Assistant Professor;* Robin Tellor, *Assistant Professor;* Frank J. Conway, *Lecturer;* Charles E. Holt, *Lecturer;* Paul H. Schudel, *Lecturer;* Louis Tepper, *Lecturer;* Thomas F. Upham, *Lecturer*

The Department of Physical Education for Men strives to meet the needs and interests of each college student by providing opportunities for physical fitness and skill development in a wide variety of physical and recreational activities.

In the basic instructional program, required and elective activity courses, instruction is aimed at providing the attitudes, knowledges, and skills necessary for the intelligent utilization of opportunities for active recreation while at the University and in later life.

The Department also offers a program of professional preparation for men wishing to enter the fields of physical education or recreation education.

Requirements and Regulations

All entering freshman male students (except majors) must register for Physical Education 301, the non-credit undergraduate required physical education program. A student must continue in physical education until such time as all requirements for the basic instructional program of physical education are completed or for a period not to exceed two years. Freshmen interested in selecting physical education or recreation education as a field of concentration should elect Physical Education 441 in place of 301.

Each student must, before entering the University, have a physical examination by a physician. Students with physical disabilities or limitations must register for physical education as other students. In most cases, modified activities are recommended by the University Physician.

Special gymnasium uniforms are provided, consisting of blue trunks, grey jersey, and grey socks. Students are required to furnish regulation gymnasium sneakers and are encouraged to supply their own equipment in the individual sports. Equipment is furnished for badminton, fencing, golf, handball, riflery, squash, and tennis. Students should check the requirements for equipment and special fees before enrollment.

301. Required Physical Education

All male freshman students will be required to take tests in three different areas of physical education: (1) physical efficiency, (2) swimming ability, and (3) skill in two recreational-type sport activities. The tests will be administered over a two-week period at the beginning of the freshman year.

Those students whose physical efficiency test performance is not satisfactory will be assigned to a developmental course during their first semester. Freshmen who fail to pass the swim classification test will enroll in a beginning swimming course for a semester.

Students may demonstrate proficiency in two recreational-type sport activities by passing a skill test and, in some cases, a written knowledge test. The selected activities include: badminton, golf, handball, ice skating, riding, skiing, squash, swimming, and tennis. These proficiency tests are administered at scheduled intervals during the school year.

Students unable to pass the tests and those freshmen who do not wish to take proficiency tests in any of the above sport activities must enroll in two (one per eight-week quarter) physical education courses of their choosing which are in the required physical education program for men.

Those freshmen who achieve acceptable standards in the three test areas upon entrance to the University will be exempted from the physical education requirement. Students not satisfying established test standards must take an appropriate physical education program without academic credit until such time as they either pass the proficiency tests or satisfactorily complete prescribed physical education activity courses for a period not to exceed two years. 3 hours, 0 credit. NLG.

433, 434. Elective Physical Education
Freshmen and upperclassmen may elect additional physical education activity courses for credit upon completion of the undergraduate physical education proficiency requirement by registering for 433, 434. Courses in aquatics, dance, gymnastics, and individual, dual, and team sports are offered each semester on a seasonal basis. No activity may be repeated for credit. Prerequisite: Physical Education 301. 3 hours, 1 credit. NLG.

Physical Education Courses — Specialized
Specialized courses for students majoring in physical education providing basic skills in a variety of physical activities taught in the elementary or secondary school. Physical Education 441, 442 are for freshmen; 443, 444, 445 are for sophomores; 446, 447, 448 are for juniors; 449, 450 are for seniors. 3 hours, 1 credit. NLG.

Theory Courses

453. Principles of Physical Education
An approach to the field of physical education and related areas through a study of the evolutionary and historical factors affecting its development from pre-historic times to the present day. The application of principles from the fields of biology, psychology, ethology, and sociology to the field will be discussed. The place of physical education in the academic community and its relation to the aims and objectives of general education as well as the world of sports and athletics will be considered. Miss Browne. 4 credits.

510. Medical Aspects of Sports and Physical Education
The etiology, pathology, treatment, and prognosis of sports injuries are discussed and related to preventative measures. The various problems encountered in teaching physical education to the physically and mentally handicapped are related to the different pathologies of each disability. Mr. Aultman. 4 credits.

521. Theory of Coaching Basketball*
Theory and practice in the fundamentals of individual offense and defense. The various styles of team offense and defense and rules of the game. Problems in handling and conditioning a team. Mr. Haubrich. Prerequisite: Physical Education 442. 2 credits.

522. Theory of Coaching Football*
Analysis of various systems of play. Instruction in team and individual offensive and defensive fundamentals. The theory, strategy, generalship of team play, coaching methods, physical conditioning, and rules. Football staff. Open to physical education majors only. 2 credits.

523. Theory of Coaching Hockey*
Theory and practice in the fundamentals of team offense and defense, the fundamentals of each position, coaching methods, physical conditioning, and rules. Mr. Holt. 2 credits.

524. Theory of Coaching Baseball*
Theoretical and practical consideration of basic principles of batting and fielding, the fundamentals of each position, special stress on problems of team play, coaching methods, physical conditioning, and rules. Mr. Conner. Prerequisite: Physical Education 441. 2 credits.

525. Theory of Coaching Soccer*
Combination of lectures and on-the-field demonstrations to help teachers and coaches view practices and concepts used in modern soccer. Material covered will include the following: fundamental and advanced skills and techniques, offensive and defensive principles of team play, tactical formations and strategy, methods of training and practicing, rules of the game. Mr. Weiland. Prerequisite: Physical Education 447. 2 credits.

* Students in the physical education curriculum must complete no less than four of these courses.

526. Theory of Coaching Wrestling*
Theory, practical teaching methods, and the development of advanced skills in an individual sport. The course will emphasize theory and practical application of wrestling skills and techniques from basic maneuvers to the more advanced. The basic objective of the program will be to develop sufficient skills and knowledge to teach and coach wrestling. Mr. Hess. Prerequisite: Physical Education 441. 2 credits.

527. Aquatic Leadership Training*
The course is designed to survey the methods, organization, and administration of both American Red Cross and YMCA aquatic programs. Topics covered include methods of teaching, swimming, diving and lifesaving, program planning, officiating, operation and maintenance of swimming pools, camp waterfront, health and safety aspects of the aquatic program, legal problems, skin and SCUBA diving, drownproofing. Mr. Arnold. Prerequisite: senior lifesaving certificate. 2 credits.

528. Theory of Coaching Track and Field*
Instruction and practical demonstration in starting, sprinting, middle distance and distance running, relay, hurdling, high and broad jumping, pole vault, shot putting, discus, hammer, and javelin throwing. Methods of preparing contestants for the various events. Mr. Sweet. Prerequisite: Physical Education 445. 2 credits.

529. Theory of Coaching Gymnastics*
The theory, practical teaching methods, and officiating of competitive gymnastics. Emphasis will be placed on the construction of gymnastic routines, from the elementary to the international level. Practical work sessions will be held. Mr. Datilio. Prerequisite: Physical Education 444. 2 credits.

530. Theory of Coaching Swimming and Diving*
A thorough analysis of the techniques of coaching swimming and diving. Course includes a systematic treatment of the philosophy, historical development, and psychological theories of coaching aquatics. Much emphasis is placed on the mechanical and kinesiological aspects of the competitive strokes and required and optional dives, both low and high board. Mr. Arnold. Prerequisite: Physical Education 443. 2 credits.

582. Personal and Community Health
The individual aspects of healthful living and the problems of community health as they relate to disease prevention and control. Mr. Wear. 4 credits.

620. Physiology of Exercise
The acute and chronic physiological effects of exercise. Emphasis will be on respiration, circulation, and energy metabolism. Lectures will be supplemented by laboratory sessions demonstrating physiological adaptation to the demands of muscular activity. Mr. Kertzer. Prerequisite: Zoology 508. 4 credits.

652. Kinesiology
The science of human motion. Detailed analysis of human muscular anatomy and a consideration of the actions of skeletal muscles in light of recent electromyographic evidence. Application of selected concepts of muscle physiology and biomechanics to physical education activities. Mr. Kertzer and Mr. Aultman. Prerequisite: Zoology 507. 4 credits.

665. Administration of Physical Education in Secondary Schools
Administrative methods in the conduct of physical, health, and recreation education. The planning of programs and policies in light of past and present philosophies and in regard to current programs, facilities, equipment, selection of staff, and public relations. Mr. Carter. 4 credits.

668. Measurement Procedures in Physical Education
Procedures used in the interpretation and administration of measurement techniques in physical education. Essential

elementary statistical methods are covered so that measurement data may be scientifically evaluated for application to the program. Mr. Weiland and Miss Knowlton. 4 credits.

775. Perceptual Motor Learning
The variables which affect the learning and performance of skilled activity, including considerations of the learning process and the acquisition of skill as determined by the perceptual motor characteristics of the learner. Miss Hoff. 4 credits.

792. Problems of Teaching Physical Education in the Elementary School
Methods, materials, and organization of a comprehensive program of activities for use primarily in the elementary school. Miss Newman and Mr. Barstow. 4 credits.

Physical Education for Women (91)

Janet Atwood, *Associate Professor and Chairman;* Marion Beckwith, *Professor;* Evelyn Browne, *Professor;* Caroline S. Wooster, *Associate Professor;* Barbara K. Newman, *Associate Professor;* Katherine Amsden, *Assistant Professor;* Phyllis Hoff, *Assistant Professor;* Karen Hogarth, *Assistant Professor;* Elizabeth E. Knowlton, *Assistant Professor;* Joyce Mills, *Assistant Professor;* Jean Morrison, *Assistant Professor;* Lona Lesh, *Instructor;* Jean Mead, *Instructor;* Joan Weston, *Instructor;* Tuovi S. Cochrane, *Part-time Instructor;* Joyce Kertzer, *Part-time Instructor;* Judith B. Jones, *Half-time Instructor;* Margery Milne, *Part-time Lecturer*

The Department of Physical Education for Women provides an opportunity for each student to participate in a program which will give her a theoretical and practical knowledge of movement concepts and an understanding of the need for physical activity in developing total fitness. The program includes a movement fundamentals course and a wide choice of sports, dance, aquatics, and gymnastic courses. An opportunity for participation in a modified program is provided for those students with medical restrictions

Requirements and Regulations

All women students are required to register for Physical Education 301 upon entrance to the University and to continue enrollment in that course until requirements for the proficiency requirement are met or for a period not to exceed four semesers. A student with a physical limitation must follow the same procedure as other students, including registration for Physical Education 301. A modified program of activity will be scheduled for the student as need indicates. Students interested in majoring in physical education or recreation and parks should register for Physical Education 411 and 412 in place of Physical Education 301.

A student may become exempt from Physical Education 301 by demonstrating proficiency in three areas of the program: fundamentals of movement, swimming, and two activities to be chosen by the student. All students are required to take a swimming safety test upon entrance to the University. A student failing the test must enroll in swimming until she passes the safety swimming test or for a period not to exceed one semester.

The Elective Program

Either a quarter-course or a half-course in physical education at the 400 level may be elected for credit by students who have satisfied the Physical Education 301 requirement. A student who is still completing Physical Educaation 301 may take elective work in physical education at the 400 level for credit with permission of the Department of Physical Education for Women.

Intermediate and Advanced Instruction
To provide for the more highly skilled student and the interested participant, the department offers coursework at intermediate and advanced levels in a variety of activities. Students are encouraged to elect physical education for further experience and participation in activity.
Special uniforms are provided consisting of black leotards and tights and a blue cotton tennis-type dress. Students are required to furnish white socks, sneakers, a bathing cap, and their own individual equipment for such activities as tennis, skiing, and skating. Equipment for all other activities is furnished by the department. A $35.00 fee per season is charged for riding; fees are also charged for off-campus activities such as bowling and skiing.

Women's Recreation Association Program
Club activities, intramurals, and an intercollegiate sports program, designed to provide recreational experiences for both the novice and the highly skilled individual, are sponsored jointly by the Women's Recreation Association and the department. Club groups include Badminton Club, Contemporary Dance Club, Durham Reelers (folk dance), Fencing Club, Gymnastics Club, Riding Club, Riflery Club, Skating Club, and Synchronized Swimming Club.

Instructional Courses
Instruction is provided in the following activity courses on a seasonal basis in four quarters: Fall, Winter I, Winter II, Spring: archery, badminton, basketball, bowling, campcraft, dance (folk and square, modern), elementary games, field hockey, figure skating, fitness laboratory, foil fencing, fundamentals of movement, golf, gymnastics, individuals, lacrosse, outdoor education, riding, riflery, ski conditioning, skiing, softball, squash, swimming (basic instruction, diving, synchronized, senior life saving, water safety instructor), tennis, and volleyball.

Instructional Program

301. Required Physical Education
Coursework in fundamentals of movement and activities elected from the sports, dance, aquatics, and gymnastics areas. 3 hours, no credit.

405, 406. Elective Physical Education
Coursework in physical education. Activities elected from sports, dance, aquatics, and gymnastics areas. May be elected by students enrolled in Physical Education 301 with departmental permission. 3 hours, 1 credit.

407, 408. Elective Physical Education
Coursework for students who wish to elect a second course in physical education. 3 hours, 1 credit.

Physical Education Courses — Specialized
Specialized courses for students majoring in physical education or recreation and parks. Others by permission of instructor. 411, 412, 421, 422 for freshmen; 413, 414, 423, 424 for sophomores; 415, 416, 425, 426 for juniors; 417 for seniors. 3 hours, 1 credit.

Theory Courses — Physical Education

428. Water Safety Instructors' Course
Conducted through the auspices of the American Red Cross, the course includes analysis of aquatic techniques and methods of teaching swimming, diving, and lifesaving. Instructor authorization is awarded to candidates who demonstrate a high caliber of personal skill, knowledge, and teaching ability in aquatics. Prerequisite: current senior lifesaving certification. 2 credits.

431. Analysis of Rhythm
A theoretical and practical study of the factors affecting rhythm. Miss Morrison. 2 credits.

432. Labanotation
The study and practice of recording human movement by the method of *Laban-*

otation. Miss Morrison. Prerequisite: intermediate modern dance or permission of instructor. 2 credits.

433. Dance Composition
A practical, developmental approach to the process of creating dance. Prerequisite: intermediate modern dance. Miss Morrison. 2 credits.

453. Principles of Physical Education
An approach to the field of physical education and related areas through a study of the evolutionary and historical factors affecting its development from pre-historic times to the present day. The application of principles from the fields of biology, psychology, ethology, and sociology to the field will be discussed. The place of physical education in the academic community and its relation to the aims and objectives of general education, the world of sports, and athletics will be considered. Miss Browne. 4 credits.

454. Organized Camping
The methods, objectives, and purposes of organized camping; standards, facilities, equipment, food, sanitation, health, and safety requirements; program planning and leadership qualifications; integration of camping in the public schools; basic outdoor living skills. Mrs. Wooster. Permission of instructor. 4 credits.

554. Theory of Teaching Dance
A study of the methods, materials, techniques and theories of teaching dance. The first half of the course covers dance as an art form; the second half, recreational dance. Miss Morrison. Prerequisite: beginning, intermediate modern dance; folk, square, and social dance. 4 credits.

563, 564. The Theory of Teaching Sports for Women
The methods and principles involved in the teaching of sports and lead-up games with emphasis on coaching methods, strategy, and techniques of officiating. Discussion of equipment, history, and tactics of selected sports. Staff. Prerequisite: elementary courses in selected individual and team sports. 2 lectures, 3 laboratories, 2-4 credits.

582. Personal and Community Health
The individual aspects of healthful living and the problems of community health as they relate to disease prevention and control. Mr. Wear. Prerequisite: Biology 401-402. 2 credits.

620. Physiology of Exercise
The acute and chronic physiological effects of exercise. Emphasis will be on respiration, circulation, and energy metabolism. Lectures will be supplemented by laboratory sessions demonstrating physiological adaptation to the demands of muscular activity. Mr. Kertzer. Prerequisite: Zoology 508. 4 credits.

625. Dynamics of Human Movement
A consideration of factors which affect efficiency in human movement. An examination of the generality of movement in relation to fundamental and specific motor skills found in sports, dance, and everyday movement sequences. Miss Knowlton. 2 credits.

652. Kinesiology
The science of human motion. Detailed analysis of human muscular anatomy and a consideration of the actions of skeletal muscles in light of recent electromyographic evidence. Application of selected concepts of muscle physiology and biomechanics to physical education activities. Mr. Kertzer and Mr. Aultman. Prerequisite: Physical Education 620. 4 credits.

655. Remedial Gymnastics
The adaption of exercise to individual needs, capacities, and limitations; causes and treatment of physical abnormalities; theory and techniques of massage. Mrs. Wooster. Prerequisite: Zoology 601 or concurrently. 3 lectures, 3 laboratories, 4 credits.

656. Problems of Health Education
A survey of total school health: environment, services, and education. Methods, materials, and principles of teaching

school health from kindergarten through grade 12. Open to physical education majors and others by permission of the instructor. Mrs. Wooster. 3 credits.

668. Measurement Procedures in Physical Education
Procedures used in the interpretation and administration of measurement techniques used in physical education. Essential, elementary statistical methods are covered so that measurement data may be scientifically evaluated for application to the program. Miss Knowlton and Mr. Weiland. 4 credits.

775. Perceptual Motor Learning
The variables which affect the learning and performance of skilled activity, including ability and motivational characteristics of the learner, and the processes which enhance skill acquisition. Miss Hoff. 3 lectures, 1 laboratory, 4 credits.

Student Teaching Block

665. Administration of Physical Education in Secondary Schools
Administrative methods in the conduct of physical education, health education, and recreation. The planning of programs and policies in the light of past and present philosophies and in regard to current programs, facilities, equipment, selection of staff, and public relations. Miss Beckwith, Miss Amsden. 4 credits.

Physical Education-Education 792. Problems of Teaching Physical Education in the Elementary School
The methods, materials, and organization of a comprehensive program of activities for use primarily in the elementary school and in recreation programs. Miss Newman. Prerequisite: elementary games or its equivalent. 4 credits.

Education-Physical Education 794. Directed Teaching of Physical Education
Opportunity for teaching physical education activities under supervision primarily in the elementary and secondary schools. Miss Newman. Prerequisite: Physical Education-Education 792 or concurrently. 1 lecture, 2-5 hour laboratories, 6 credits.

Education 659 is also taken within the block program.

Theory Courses — Recreation and Parks

455. Introduction to Community Recreation
History, trends, community organization, financial aspects of administration, program planning, and leadership of community recreation, including playgrounds. Principles and philosophy of recreation. Elective for sophomores, juniors, and seniors. 4 credits.

460. Recreation Leadership
A practical study of the areas of social recreation, materials, and methods of leadership in the areas of games, music, drama, etc. Creative to formal training in leadership techniques with all kinds of group recreation situations. Designed for those desiring work on playgrounds, in camps, scouts, hospital, 4-H, and other leisure-time groups. 3 credits.

541. Recreation Practicum
A practical leadership workshop where the student actually plans, leads, and evaluates experiences of a recreational nature with area groups desiring help with recreation leadership. Majors only. Prerequisite: Physical Education 460. 2 credits.

561. Nature Recreation
A course that evaluates the natural phenomenon surrounding man through an acquisition of a general background in the natural and physical sciences. Current practices, leadership techniques, and activity skills include field identification of animal, bird, fish, and insect life, tree and shrubs, terrain and geological formations, cloud, wind, and weather implications and conservation methods as they

relate to man in his natural environment. Mrs. Milne. 2 lectures, 1 laboratory, 4 credits.

644. Outdoor Recreation
School camping and its methodology. Class includes preparing, experiencing, and evaluating two weeks at camp with elementary school children. Use of wildlife and conservation specialists with work in practice and theory of outdoor living. 4 credits.

663. Recreation and Park Administration
Administrative problems and challenges in park and recreation departments. Staff and departmental organization, personnel, facilities, finance, program and public relations. Administration, operation, and maintenance of city parks and recreation facilities will be evaluated. 4 credits.

667. Areas and Facilities Design for Parks and Recreation
Methods and materials available to the recreation and parks designer in accordance with established standards. Various assigned projects with one major design and rendering work. 1 lecture, 4 laboratories, 4 credits.

788. Recreation Field Work
Opportunity for participation in the planning and operation of a variety of recreation programs, under supervision, in nearby agencies and community centers. Prerequisite: Physical Education-Education 792 or concurrently. 1 lecture, 2-5 hour laboratories, 6 credits.

798. Recreation Research Seminar
Consideration of the various behavorial, sociological, and historical aspects of recreation that may lend themselves to research. Students will prepare short research papers, and select and prepare topics for independent study in fields of special interest. Research methodology and evaluative techniques. This course is primarily for recreation and parks majors. 4 credits.

Physical Science (44)

401-402. The Evolution of Physical Science
The principles and methods of physical science illustrated by the development of major scientific ideas in the physical world. The course is directed toward an understanding of the intellectual achievement and problems of science as part of culture. Mr. Schneer. 3 lectures, 1 laboratory, 4 credits. No credit toward a major.

(789). Seminar in the History of Science
Selected topics in the history of science, conducted through the use of special lectures, individual study, oral, and written reports. The subject of the seminar will vary from year to year. This course is the same as History 789. Mr. Schneer. Prerequisite: permission of instructor. 4 credits. (Course usually offered in the second semester.)

Physics (86)

Robert E. Houston, Jr., *Professor and Chairman;* David G. Clark, *Associate Professor and Associate Chairman;* Harry H. Hall, *Professor Emeritus;* Edward L. Chupp, *Professor;* Robert H. Lambert, *Professor;* John A. Lockwood, *Professor;* Lyman Mower, *Professor;* John E. Mulhern, Jr., *Professor;* William R. Webber, *Professor;* Richard L. Kaufmann, *Associate Professor;* Robert E. Simpson, *Associate Professor;* Roger L. Arnoldy, *Assistant Professor;* L. Christian Balling, *Assistant Professor;* John F. Dawson, *Assistant Professor;* John Dowling, Jr., *Assistant Professor;* Mark P. Klein, *Assistant Professor;* George H. Mullen, *Assistant Professor;* Antal A. Sarkady, *Instructor;* Robert W. Jenkins, *Instructor* (part-time)

401-402. Introduction to Physics I and II
A broad survey of both classical and modern physics with emphasis on the latter. Designed to enable the student to appreciate the role of physics in the society and technology of today. While emphasis is placed upon the fundamental laws of nature on which all science is based, the interrelationships between other disciplines will be stressed. 2 lectures, 1 recitation, 1 laboratory. 4 credits.

405. Concepts of Physics
A descriptive course investigating a limited number of important physical systems. Emphasis will be placed on how the system is to be investigated and the patterns in which the results fall. The intuitive concepts used in investigations will be traced into their application in modern physics. Every effort will be made to relate the patterns of thought in physics to patterns of thought in liberal arts. Recommended for liberal arts juniors and seniors. Not offered in 1969. 4 credits.

406. Introduction to Modern Astronomy
A brief descriptive course covering contemporary astronomical and astrophysical techniques with a review of current knowledge and theories concerning the solar system, galaxies, and the universe. Recommended for liberal arts and beginning science students. 4 credits.

407-408. General Physics I and II
An elementary course emphasizing mechanics as the foundation underlying all physics. Selected topics from electrostatics and electromagnetism. Prerequisite: Mathematics 425-426 passed or taken concurrently. Physics 407, 3 lectures, 2 recitations. Physics 408, 2 lectures, 2 recitations, 1 laboratory, 4 credits.

501-502. General Physics II and III
Selected topics from electrostatics, electromagnetism, wave motion, kinetic theory, relativity, and quantum theory. Prerequisite: Physics 404 or Physics 401-402, Mathematics 422 or 426. Must be taken as the introductory course for physics majors in the College of Liberal Arts; cannot be counted for major credit. 2 lectures, 1 laboratory, 4 credits. (Not offered after 1969-70.)

505-506. General Physics III and IV
Selected topics from wave motion, kinetic theory, relativity, and quantum theory. An introduction to Twentieth Century physics, including the structure of atoms and nuclei, the basic ideas of quantum mechanics, and solid state theory. Prerequisite: Physics 408 or equivalent for Physics 505, Physics 505 or equivalent for 506, Mathematics 527 and 528 passed or taken concurrently. 2 lectures, 1 recitation, 1 laboratory, 4 credits.

601-602. Physical Mechanics I and II
An analytical treatment of classical mechanics covering the methods of statics and dynamics of particles and rigid bodies, both in a plane and in space, and the application of these methods to physical problems; oscillations; constrained motion; generalized co-ordinates and Lagrange's Equations. Prerequisite: Physics 507, 508, or equivalent; Mathematics 528. 4 credits.

605-606. Experimental Physics I and II
Experiments in electrical measurements and circuits, passive and active circuit elements, optics, and atomic physics. Prerequisite: Physics 601 taken concurrently. 2 lectures, 2 laboratories, 4 credits.

607. Physical Optics
The electromagnetic theory of light, interference, diffraction, polarization, related phenomena, and non-linear optics. Prerequisite: Mathematics 527. 4 credits.

608. Thermodynamics
An introduction to thermal physics and kinetic theory. Prerequisite: Mathematics 527. 4 credits.

609-610. Experimental Physics III and IV
Work of a project nature. Special problems are assigned to the individual student. Prerequisite: senior standing in physics. 2 laboratories. 4 credits.

613-614. Special Topics I and II
Any selected topics not sufficiently well covered in a general course. Prerequisite: senior standing in physics. 4 credits.

618. Introduction to Solid State Physics
A brief summary of the theory underlying the behavior of solids will be given. Emphasis will be placed on transport theory and the interaction of radiation and matter. The operation of semiconducting and superconducting devices and lasers will be considered. Prerequisite: Mathematics 527, Physics 508, or equivalent. 4 credits.

696. Independent Study
Individual study projects in physics under the direction of a faculty adviser. Open only to physics honor students. 4 credits.

701. Introduction to Quantum Mechanics
An introduction to quantum mechanics with applications to atomic and molecular spectra. Prerequisite: Mathematics 635 passed or taken concurrently. 4 credits.

702. Atomic and Nuclear Physics
Natural radioactivity, nuclear reactions, nuclear scattering, models of the nucleus, high energy nuclear physics, cosmic rays. Prerequisite: Physics 701. 4 credits.

703-704. Electricity and Magnetism I and II
Foundation of electromagnetic theory, including electrostatics, dielectric theory, electromagnetism, magnetic properties of matter, alternating currents, Maxwell's field theory, and an introduction to electrodynamics. Prerequisite: Physics 507-508 or equivalent, Mathematics 635 passed or taken concurrently. 4 credits.

Plant Science (32)

Lincoln C. Peirce, *Professor and Chairman;* Ford S. Prince, *Professor Emeritus;* Gerald M. Dunn, *Professor;* Russell Eggert, *Professor;* Clarence A. Langer, *Professor;* Leroy J. Higgins, *Associate Professor;* Lorne A. McFadden, *Associate Professor;* Douglas G. Routley, *Associate Professor;* Owen M. Rogers, *Associate Professor;* James B. Loy, *Assistant Professor;* George O. Estes, *Assistant Professor;* James R. Mitchell, *Assistant Professor;* Otho S. Wells, *Assistant Professor*

421. Concepts of Plant Growth
Development of genetic and physiological concepts underlying plant growth and response of plants in modified environments. Open to all students. Mr. Estes. 3 lectures, 1 laboratory, 4 credits.

427. Landscaping the Home Grounds
The design and maintenance of small properties with emphasis on the principles of arrangement and the use and identification of plant materials in the beautification of home surroundings. Mr. Rogers. 2 lectures, 1 laboratory, 4 credits.

663. Fruit Crops
Growth and management of tree and small fruit crops, storage and marketing of produce. Mr. Eggert. Prerequisite: Plant Physiology. 3 lectures, 1 laboratory, 4 credits. (Alternate years, offered first semester, 1969-70.)

664. Vegetable Crops
Classification of vegetable crops. Genetic and physiological response of crops to management and climate. Mr. Peirce. Prerequisite: Plant Physiology. 3 lectures, field trip, 4 credits. (Alternate years, offered second semester, 1970-71.)

665. Pasture Crops
Growth, culture and management of the important forage and pasture crops. Mr. Higgins. Prerequisite: Plant Physiology. 3 lectures, 1 laboratory, 4 credits. (Alternate years, offered first semester, 1969-70.)

667. Turfgrass Management
Characteristics of growth of fine turfgrasses, their adaptation for recreational and aesthetic use. Prerequisite: Plant Physiology. 2 lectures, 1 laboratory, 1 field trip, 4 credits. (Alternate years, offered first semester, 1970-71.)

668. Annual Crops
Growth and management of annual grasses and silage crops. Prerequisite: Plant Physiology. 3 lectures, 1 laboratory, 4 credits. (Alternate years, offered second semester, 1970-71.)

678. Ornamental Plants
The important ornamental plants, their growth characteristics, culture, and use. Mr. Rogers. Prerequisite: Plant Physiology. 3 lectures, 1 laboratory, 4 credits. (Alternate years, offered second semester, 1970-71.)

699 (699). Research Participation
Requires development of a project embodying the scientific method. Consultation with faculty member required. May be elected only one time at beginning of junior or senior year. Staff. 4 credits.

708. Plant Nutrition
Mineral nutrient requirements of plants, nutrient availability in soils and fertilizers; effects of environment on nutrient uptake, translocation, on differentiation of plant parts and on hardiness. Interrelationships between plant nutrient elements and effects of one element on absorption and translocation of others. Soil and tissue tests for mineral elements. Mr. Eggert. Prerequisite: plant anatomy or plant physiology, organic chemistry, soils. 3 lectures, 1 laboratory, 4 credits.

711, 712. Advanced Topics in Plant Science
A flexible course structure permitting independent study or group discussion of advanced technical or scientific topics. Students should consult with appropriate course coordinator before registering. 2 or 4 credits.
R-1 Physiology — Mr. Estes
R-2 Genetics — Mr. Dunn
R-3 Ornamentals — Mr. Rogers
R-4 Vegetable Crops — Mr. Peirce
R-5 Fruit Crops — Mr. Eggert
R-6 Field Crops — Mr. Higgins
R-7 Turfgrass — Mr. Higgins

762. Plant Metabolism
The function, occurrences, synthesis, and degradation of plant constituents. Major emphasis is placed on respiration and photosynthesis and their relationships to the metabolism of lipids and nitrogen compounds. Mr. Routley. Prerequisite: biochemistry. 2 or 4 credits. Laboratory optional.

769. Plant Growth Regulators
Study of hormones and plant growth substances; relationship to differentiation and development of plant tissues. Mr. Routley. Prerequisite: plant physiology, biochemistry. 2 or 4 credits. Laboratory optional. (Alternate years, offered first semester, 1971-72.)

773. Methods and Theory of Plant Breeding
Theory and use of plant breeding systems with emphasis on quantitative plant improvement. Mr. Peirce. Prerequisite: genetics, statistics. 3 lectures, 1 laboratory. 4 credits. (Alternate years; offered first semester, 1970-71.)

Political Science (52)

George K. Romoser, *Professor and Chairman;* John T. Holden, *Professor;* Robert B. Dishman, *Professor;* Erwin A. Jaffe, *Associate Professor;* Frederic W. Wurzburg, *Associate Professor;* David L. Larson, *Associate Professor;* John H. Woodruff, *Associate Professor;* Peter Savage, *Associate Professor;* Lawrence W. O'Connell, *Assistant Professor;* Joseph P. Ford, *Assistant Professor;* Robert E. Craig, *Instructor;* Robin Hunter, *Instructor;* Raymond E. Matheson, *Instructor;* Roger

Hoeh, *Research Associate, Public Administration Service*

Except for the introductory course and independent study and seminar offerings, political science offerings are listed by fields, with courses substantially relating to more than one field cross-listed.

Courses which have an asterisk (*) following the number are often alternate-year offerings. Consult the department for schedule of courses offered in a particular semester.

401-402. Introduction to Political Science
The nature of politics, its vocabulary and purpose; institutions, ideologies, and behavior. The American political system; significant contemporary issues. Required of all majors in political science. Staff. 4 credits.

American Politics

511, 512. State and Local Politics
History, structure, and processes of American government at the level of the state and their subdivisions. Mr. Dishman, Mr. Ford. 4 credits.

571, 572.* American Political Thought
Major theories which have contributed to American political thinking from colonial to present times. Mr. Jaffe. 4 credits.

715. Urban and Metropolitan Politics
Planning, management, and problems of the urban community. Mr. O'Connell. 4 credits.

716. Political Parties and Voting Behavior
Functions, organization, operation, and bases of electoral support of American political parties. Mr. Craig. 4 credits.

717.* Pressure Groups and Public Policy
Functions, organization, operation, and bases of support of American pressure groups. Mr. Ford. 4 credits.

718. Psychology of Political Behavior
Cultural, social, economic, and emotional forces molding the citizen's political activity. Mr. Craig. 4 credits.

719. Legislative Behavior
Role, organization, operation, and conduct of American legislatures. Mr. Dishman, Mr. Craig. 4 credits.

720. The President as Political Executive
The American president's ways and means of pursuing political objectives. Mr. Dishman, Mr. Craig. 4 credits.

721. Administrative Process
The administrative and bureaucratic process in public life. Mr. O'Connell, Mr. Savage. 4 credits.

722.* Administration of Justice
Criminal and civil justice under various legal institutions; contemporary role of police, prosecutors, judges, juries, counsel, and interest groups in the legal process. 4 credits.

723. Supreme Court and the Judicial Process
The Supreme Court as interpreter of law and arbiter among forces in American politics. Mr. Dishman. 4 credits.

724.* Political Socialization
Pressures integrating the individual into the context of American political life. 4 credits.

725. United States Foreign Policy
The formulation and execution of American foreign policy. Mr. Larson. 4 credits.

727. Selected Topics in American Politics
Courses in American politics of a special nature not regularly offered. Staff. 4 credits.

Comparative Politics

531. Comparative Politics
Concepts of political dynamics, institutional arrangement, and change in the modern world. 4 credits.

532. Democratic Systems
Western European politics: Britain, France, Germany. Mr. Woodruff, Mr. Wurzburg. 4 credits.

533. Dictatorship and Totalitarianism
Hitler's Germany, Stalin's Russia, modern movements in the developed and underdeveloped world. Mr. Woodruff, Mr. Wurzburg. 4 credits.

736. Communist Systems
A comparative study of communist politics. 4 credits.

737, 738. Comparative and International Area Studies
The politics of individual nations, groups of nations, or regions. 4 credits. The following listing of individual courses may be expanded or contracted from time to time, and courses will be offered as staff is available and student needs dictate:

a. Government and Politics of the U.S.S.R.
b. Soviet Foreign Policy.
c. Government and Politics of China. Mr. Woodruff.
d. Government and Politics of Japan. Mr. Woodruff.
e. Contemporary South Asia. Mr. Holden.
f. Contemporary Southeast Asia. Mr. Holden.
g. Governments of Latin America. Mr. Larson.
h. European Political Parties. Mr. Wurzburg; Mr. Romoser.
i. Government and Politics of France. Mr. Wurzburg.
j. Government and Politics of Germany. Mr. Romoser.
k. Government and Politics of Canada. Mr. Woodruff.

745. Politics of Development
Concepts of political change viewed in relation to existing political situations. Mr. Savage. 4 credits.

746.* Comparative Administration
The history, organization, and potential of public bureaucracies as a political instrument. Mr. Savage. 4 credits.

747. Selected Topics in Comparative Politics
Courses in comparative politics of a special nature not regularly offered. Staff. 4 credits.

International Relations

403. America in World Affairs
Issues confronting the United States as a world power and policies to meet them. Mr. Holden. 4 credits.

551, 552. International Relations
Introduction to the study of international relations, including inter-nation simulation. Mr. Larson. 4 credits.

755.* International Politics
Problems and choices confronting nation states in dealing with conflict of regional and international scope. Mr. Holden. 4 credits.

756.* Foreign Policies of the Great Powers
Application of foreign policies in the international political process. Mr. Holden. 4 credits.

758.* International Law
Theory, practice, and function of law in international disputes as analyzed from decisions of national and international tribunals. 4 credits.

759. International Organization
Collective security and cooperation through international organizations such as the League, United Nations, and regional bodies. Mr. Romoser, Mr. Larson. 4 credits.

737, 738. Comparative and International Relations
See listing under Comparative Politics. 4 credits.

767. Selected Topics in International Relations
Courses in international relations of a special nature not regularly offered. Staff. 4 credits.
For information on the international relations option in the department see page 96.

Political Thought

571. American Political Thought
See listing under American Politics.

775. Classical and Medieval Political Thought
Origins of political philosophy in the West, and political thinkers from the Greeks to Machiavelli. Mr. Romoser, Mr. Jaffe. 4 credits.

776. Modern Political Thought
Modern political theorists from Hobbes to Marx. Mr. Jaffe, Mr. Romoser. 4 credits.

777. Contemporary Ideologies and Political Thought
Liberalism, conservatism, and radicalism; contemporary ideologies of commitment and scientism and their implications. Mr. Romoser, Mr. Jaffe. 4 credits.

787. Selected Topics in Political Thought
Courses in political thought of a special nature not regularly offered. Staff. 4 credits.

Scope and Methods

691.* Logic of Empirical Political Inquiry
The empirical method of procedure, evidence, and proof in explaining political reality. 4 credits.

793.* Political Sociology
The social bases of political activity. 4 credits.

794. Methods of Research in Political Behavior
Methodology and techniques in evaluating political behavior, surveys, experimental designs, and basic data processing. Aspects of computer technology and political research. Mr. Craig. 4 credits.

Independent Study and Seminars

795, 796. Independent Study
Research in various fields on subjects of special interest to the student, carried out under the instructor's supervision. Staff. 4 credits.
a. American Politics.
b. Comparative Politics.
c. International Relations.
d. Political Thought.
e. Scope and Methods.

797, 798. Seminars
Small group discussion and examination of themes chosen by the instructor. Staff. 4 credits.
a. American Politics.
b. Comparative Politics.
c. International Relations.
d. Political Thought.
e. Scope and Methods.

Psychology (67)

Raymond L. Erickson, *Professor and Chairman*; Herbert A. Carroll, *Professor Emeritus*; George M. Haslerud, *Professor*; Frederick M. Jervis, *Professor*; Robert I. Watson, *Professor*; Peter S. Fernald, *Associate Professor*; Earl C. Hagstrom, *Associate Professor*; Ronald E. Shor, *Associate Professor*; Robert G. Congdon, *Assistant Professor*; G. Alfred Forsyth, *Assistant Professor*; Leslie A. Fox, *Assistant Professor*; Gordon A. Haaland, *Assistant Professor and Assistant Chairman*; Burton I. Klinger, *Assistant Professor*; Edward F. Rutledge, *Assistant Professor*; Peggy D. Forsyth, *Instructor*; Anthony A. Walsh, *Instructor*; Kirk E. Farnsworth, *Lecturer*

General Courses

401. Introduction to Psychology
Psychology as a behavioral science with emphasis on both its theoretical and

applied aspects. This is a prerequisite for all other courses in the department, except with permission of the Departmen Chairman. Offered both semesters. To actively experience the nature of psychological research, the student is expected to serve as a subject. 4 credits.

545. Clinical Approaches to Human Behavior
The dynamics of normal and abnormal behavior are considered from the viewpoints of Freud, Rogers, learning theorists, existentialists, and others. The emphasis is distinctly on human behavior and attention is given to clinical procedures of evaluating and modifying behavior. No training in the use of clinical techniques is given. Tht emphasis is on familiarizing the student with the nature of the clinical approach. Prerequisite: Psychology 401. 4 credits.

575. Development of the Normal and Exceptional Child
The behavioral and psychological development of children from the prenatal period through adolescence. Topics include intellectual, social, personality, and physical development with discussion of major theorists and current findings in these areas. The exceptional child is discussed in terms of characteristics, causation, adjustment problems, and educational requirements. Areas of exceptionality include giftedness, retardation, physical handicaps, and emotional disturbance. Prerequisite: Psychology 401. 4 credits.

Major Courses

601. Statistics and Methodology in Psychology
Introduction to the uses of statistical analysis and experimental methodology in psychological research. The major goal of the course is to aid students in understanding the basic statistical and procedural considerations involved in answering questions in psychological research. Substantive problems are emphasized as illustrations of typical applications. Prerequisite: Psychology 401. 4 credits. Required of all undergraduate majors and minors in psychology.

602. Experimental Psychology
The application of experimental methods to a variety of psychological phenomena with emphasis on the principles of experimental design and methods of data analysis. In addition to participating in and writing up a sequence of basic laboratory experiments, each student will be responsible for conceiving, conducting, and reporting an original experiment. Prerequisite: Psychology 601. 4 credits.

751-752. The Development and Behavior of Man in the Social System
A systematic examination of normal and abnormal behavior in the context of the social system. Problems of development, personality, and abnormal behavior are considered in the context of social psychological variables. Significant topics are socialization, personality theory, normal and abnormal behavior patterns, and social influence processes. Prerequisite: Psychology 601. 4 credits.

758. Psychology of Learning and Motivation
The roles of learning and motivation are studied in relation to contemporary theories of behavior and integrated with other areas of psychology. Emphases are on theory, research methods, and applications. The major concepts and most recent research findings in the areas of learning and motivation are discussed. Prerequisite: Psychology 601. 4 credits.

778. Brain and Behavior
Relationships between the nervous system and behavior. The course examines the physiological, neural, and biochemical mechanisms underlying instinct, memory, learning, emotion, and consciousness in man, as well as the evolution of these functions in lower animals. Prerequisite: Psychology 601. 4 credits.

794. The History of Psychology: An Integration
An opportunity for the major to reassess, extend, and integrate his knowledge of psychology within an historical perspective. Attention is given to antecedents in philosophy and the physical sciences and their relationship to the subsequent development of schools and systems of psychology. In addition, the course examines contemporary thought and research in the field. Normally taken during the senior year. Prerequisite: 20 major credits in psychology or permission of the instructor. 4 credits.

Special Courses

701, (701). Contemporary Topics in Psychology
A non-credit seminar focusing on topics of particular interest to students in psychology. Jointly organized by students and faculty to respond to requests of students. Prerequisite: Psychology 401. No credit.

789, (789). Special Topics
Taught by a different staff member each year. The instructor presents advanced material in an area in which he has developed specialized knowledge through research and study. Students may repeat the course, but may not duplicate areas of specialization. Prerequisite: 16 major credits in psychology or permission of instructor. 4 credits.

795, (795). Independent Study
This course provides the opportunity for a psychology major to pursue independent study with a member of the faculty. Arrangements are to be made with a specific faculty member and enrollment is by permission only. 1-4 credits.

Reserve Officers Training Corps Department of Military Science (98)

Colonel Herbert H. Flather, Infantry, *Professor of Military Science;* Major Dister L. Deoss, Air Defense Artillery, *Assistant Professor;* Major John A. Allard, Infantry, *Assistant Professor;* Captain Robert J. Bruce, Field Artillery, *Assistant Professor;* Sergeant Major George W. Higgins, *Assistant;* Master Sergeant Burley C. Johnson, *Assistant;* Sergeant First Class Donald L. Campbell, *Assistant;* Staff Sergeant Robert R. Gagnon, *Assistant;* Specialist Five Melvin E. Korschgen, *Assistant;* Master Sergeant Clarence P. Andersen, U. S. Army (Retired), *Army ROTC Property Officer*

The Army Reserve Officer Training Corps offers a course of instruction leading to a commission as second lieutenant in one of fourteen branches of the United States Army. Successful completion of the course and the award of a baccalaureate degree by the University qualify the graduate for this commission.

The military science courses follow the student's normal academic progression, i.e., a student takes Military Science 413-414 during his freshman year and Military Science 523-524 during his sophomore year. If he elects and is accepted for advanced ROTC, he will take Military Science 633-634 and Military Science 743-744 during his junior and senior years respectively.

To qualify for the advanced course and its military allowance, applicants are required to have earned a minimum overall cumulative grade average of 2.0, to have demonstrated positive leadership potential in the basic course, to be physically qualified, to be selected by the Professor of Military Science, and to be approved for admission to the program by the President of the University.

A two-year intensified program leading to a commission in the U. S. Army also will be offered. For details, contact the Professor of Military Science.

413. Fundamentals of Military Science
The organization of the United States defense establishment and its role in national security. Practical training in leadership, marksmanship, military drill, and command provides a balanced picture of the mission of the Army and an introduction to the military program. Two hours of classroom instruction plus leadership laboratory. 2 credits.

414. Concurrent Development
An integrated course consisting of leadership laboratory conducted by the Army ROTC Department and an elective University subject which, in the opinion of the student's faculty adviser and the Professor of Military Science, will develop the cadet's potential. The elective course must be selected from the areas of effective communication, science comprehension, general psychology, or political development and political institutions. A course falling within one of these areas, which is also required in the student's college curriculums, is acceptable. Credit is awarded after satisfactory completion of the elective course and leadership laboratory. NLG.

523. American Military History
A survey of American military history from the origins of the American Army to the present with emphasis on the factors which led to the organizational, tactical, logistical, operational, strategic, social, and similar patterns found in our present-day Army and society. Practical application of leadership, drill, and command. Two hours of classroom instruction plus leadership laboratory. 2 credits.

524. Land Navigation and the Principles of Military Operations
The science of military maps and land navigation. An introduction to military operations with emphasis on the principles of firepower and maneuver. Practical application of leadership, drill, and command. Two hours of classroom instruction plus leadership laboratory. 2 credits.

633. Professional Development
Military instruction for two hours each week plus a three-credit academic subject which, in the opinion of the student's faculty adviser and the Professor of Military Science, will contribute to the cadet's potential as a prospective Army officer. The academic subject must be selected from the areas of effective communication, science comprehension, general psychology, or political developments and political institutions. Military instruction, a prerequisite for cadet subsistence pay and commissioning, will include leadership laboratory and branches of the Army. The integrated course of instruction outlined above must provide for a minimum of five hours of instruction per week. Credit is awarded upon satisfactory completion of the elective course and leadership laboratory. NLG.

634. Military Leadership and Command
The principles of leadership. The theory and practice of military teaching methods. Small unit tactics. Military communication facilities. Leadership laboratory to include exercise of command of small units. Five hours of instruction per week. 3 credits.

743. Fundamentals and Dynamics of the Military Team
The concept and fundamentals of Army administration, military law and the Army readiness program stressing the position of the United States in the contemporary world scene and the impact on leadership and management problems of the military services. An overview of Army organization and a general concept of the teamwork involved in military operations to include duties in the division staff, military intelligence, staff

planning, operations, administration, logistics, and staff recommendations. Emphasis will be placed on decision making, command control, communications, and the principles of internal defense development. Leadership laboratory to include practical application of leadership principles and exercise of command. Minimum of five hours of instruction per week. 3 credits.

744. Professional Development
Military instruction for two hours each week plus a three-credit academic subject which, in the opinion of the student's faculty adviser and the Professor of Military Science, will contribute to the cadet's potential as a prospective Army officer. The academic subject may be an elective or one that is required in the student's normal academic curriculum. Military instruction, a prerequisite for cadet subsistence allowance and commissioning, will include leadership laboratory, obligations and responsibilities of an officer, and world change and military complications. The integrated course of instruction outlined above must provide for a minimum of five hours of instruction per week. Credit is awarded upon satisfactory completion of the elective course and military instruction.

406. Army ROTC Band
Open only to freshmen and sophomore men enrolled in the Army ROTC program on basis of individual tryouts. This band furnishes music for all Army ROTC military funcions. ½ credit semester. NLG.

Army Flight Training
A program conducted by licensed flight instructors which includes a thirty-five hour ground school and a thirty-six hour flying phase. Successful completion may lead to a private pilot's license and a career in Army aviation. Open to Army ROTC senior advanced-course students who can meet physical and aptitude requirements. No credit.

Department of Aerospace Studies (99)

Colonel Carl G. Yeaton, USAF, *Professor;* Major Salvatore, DeVincenzo, Jr., USAF, *Assistant Professor;* Captain Robert W. Crane, USAF, *Assistant Professor;* Captain John F. Kenney, USAF, *Assistant Professor;* Technical Sergeant Louis R. Ouellette, USAF, *Administrative;* Staff Sergeant Philip J. Armitage, *Administrative;* Staff Sergeant Richard J. L. Valliere, *Administrative*

Air Force ROTC offers both a four-year and a two-year campus program. Both programs lead to an Air Force commission. The four-year Air Force ROTC curriculum has two divisions. The general military course (basic), or lower division, consists of Aerospace Studies 415, 416, 525, and 526. In these freshman and sophomore courses the student acquires training in leadership skills, gains a broader understanding of the vital issues at play in national and international affairs, and learns the roles of the military services in national security.

The professional officer course (advanced), or upper division, consists of Aerospace Studies 635, 636, 745 and 746. These courses are open to both the four-year student as he enters his junior year and to those who enter the special two-year Air Force ROTC program. The courses include specialized instruction in the growth and development of aerospace power, astronautics and space operations, and management principles and practices. Selection for the professional officer course is based upon character, attitude, academic record, and leadership ability. Each cadet selected must be a student in good standing with the University, must successfully complete a battery of Air Force officer qualifying tests, and be physically qualified for a commission. Two-year program students must have two years of undergraduate or graduate study remaining to be eligible to apply, and must successfully complete a six-

week field training course prior to admission. Four-year students normally attend field training for four weeks in the summer between the junior and senior years.

Successful completion of the professional officer course and the award of a degree by the University qualify the student for a commission as an officer in the U. S. Air Force Reserve.

About one-third of those admitted into the professional officer course are physically qualified for, and desire, flight training as a pilot or navigator. Pilot cadets will receive, during their senior year, ground instruction and 36½ hours of flight instruction, under the supervision of the Federal Aviation Agency, as a prelude to the Air Force flight schools. schools.

Attractive financial aid is available to students entering both the four-year and the two-year programs. Students in the four-year program will be eligible to compete for merit scholarships which cover all costs of tuition, fees, and books. In addition, all students accepted for entry into the professional officer course will receive a monthly retainer pay while pursuing courses of study leading to an Air Force commission. Special pay is authorized cadets when they attend summer training at an Air Force base.

415. World Military Systems I
The first of four sequential courses required of all students in the four-year AFROTC program. This introductory course explores aspects of national power, the development of the modern superpowers, and their impact upon the world. U. S. foreign policy goals, military policy and organization for national defense are analyzed. Leadership laboratory is an introduction to military customs and courtesies and the practice of basic drill procedures. 1 lecture, 1 laboratory, 1 credit.

416. World Military Systems II
Following a brief introduction to the organization of the United States Air Force, the strategic offensive and strategic defensive forces of the United States are studied and examined. Leadership laboratory continues. 1 lecture, 1 laboratory, 1 credit.

525. World Military Systems III
The student continues to study the United States defense establishment through an analysis of the United States general purpose forces, which include the U. S. Army and Navy. Also covered are the major support commands of the U. S. Air Force. Leadership laboratory emphasizes gaining leadership experience through actual command of small units. 1 lecture, I laboratory, 1 credit.

526. World Military Systems IV
In this final course of the basic AFROTC program, the students discuss and research the changing world alliances, both Western and Communist, and analyze the prospects for war or peace. Leadership laboratory continues. 1 lecture, 1 laboratory, 1 credit.

635. The United States Air Force
The nature of military conflict and the development of aerospace power into a prime security element. The modes of employment of aerospace forces in general war, limited war, and actions short of war. Includes training in the development of leadership skills. 3 lectures, I laboratory, 3 credits.

636. United States Space Operations
The development and the importance of the national space effort, the characteristics of the solar system that affect space exploration and operation, and current and planned capabilities for space operations. Includes training in the development of leadership skills. 3 lectures, 1 laboratory, 3 credits.

745. USAF Professional Officer Development
The meaning of military professionalism, responsibilities of the professional man, and his relationship to the military services and national security. The military

justice system and specific aspects of military life. Includes training and development of leadership skills. Flight instruction, training in weather and air navigation, and an opportunity to qualify for a private pilot's license is offered to selected cadets. 3 lectures, 1 laboratory, 3 credits.

746. USAF Professional Officer Development
Leadership theory, functions, and practices; management principles and functions; problem solving; and management tools, practices, and controls. Specific personal matters to help the cadet make a rapid, effective adjustment to active duty as an Air Force officer. For those selected, flight instruction continues in weather, air navigation, and preparation for a private pilot's license. 3 lectures, 1 laboratory, 3 credits.

Resource Economics (21)

James R. Bowring, *Professor and Chairman;* Harold C. Grinnell, *Professor Emeritus;* William H. Drew, *Professor;* William F. Henry, *Professor;* George E. Frick, *Adjunct Professor;* Richard A. Andrews, *Associate Professor;* Owen B. Durgin, *Associate Professor;* Silas B. Weeks, *Associate Professor;* Nelson L. Le Ray, *Adjunct Associate Professor;* Nicolas Engalichev, *Associate Professor;* Edmund F. Jansen, Jr., *Associate Professor;* Chauncey T. K. Ching, *Assistant Professor;* Sherrill B. Nott, *Assistant Professor*

402. Economics of Resource Use and Growth
The roles of labor, capital, and technology in growth and development. The economics of agricultural production, food marketing, and consumer decision making. National policy for agricultural prices, land use, and resource development. Mr. Henry. 4 credits.

501. Agricultural Business
Structure, organization, and performance in the agricultural business sector. Major emphasis is placed on the decision-making process in management and on quantitative techniques used to aid in decision making. Demand estimation, cost analysis, pricing policies, plant location, and other related topics are integral in the course content. This material is related to the market and institutional environment within which the firm must function. Actual problems and case materials are used to develop the student's capabilities. Mr. Jansen. 4 credits.

504. Management of Farm and Related Resource-Based Business
Planning, operation, and control of firms in the institutional environment of commercial agriculture. Major emphasis is on organizing the farm firm, planning adjustments, use and analysis of records, and taxation. Laboratory experience in budgeting changes, analyzing alternatives, estimating credit needs, and farm appraisal. Emphasis is placed upon the proprietorship and partnership forms of business organization. Prerequisite: Economics 402 or Resource Economics 402 or permission of instructor. Mr. Nott. 2 lectures, 1 laboratory, 4 credits.

701. Applied Statistics I
Use of elementary statistical techniques in analysis of prepared data. Topics surveyed include elementary probability, discrete and continuous probability distributions, distributions of sample statistics, small sample theory, elementary analysis of variance, regression, correlation, chi square and non parametric analogues of regression and analysis of variance. Attention will be paid to the use of available computer programs to the solution of statistical problems. Mr. Durgin. 4 credits.

705. Structure, Economic Problems, and Planning of Communities in the Non-Urban Environment
The community is taken as an economic unit and analyzed using appropriate

methodologies with emphasis on economic growth. Economic forces relative to employment, income, transportation, housing, etc., are analyzed. Community income, expenditures and public services are taken in the context of growth and planning. Prerequisite: one course in social science. Mr. Le Ray. 4 credits.

706. Economics of Resource Development
The classical and modern theories of economic development. Economic problems of land and resources in relation to market location, urban-rural conflicting demands, and conservation and water supply. Population mobility, capital needs, and the roles of public and private leadership will complete the framework for discussion of the major resource development problems of New England. Mr. Bowring. Prerequisite: Economics 401. 4 credits.

708. Research Methods in Social Sciences
The scientific method of research. Analysis of research problems in social sciences. The design of research and the application of research techniques to identifying and solving problems. Can be used in place of Sociology 702. Mr. Drew. Prerequisite: three hours of statistics. 4 credits.

715. Linear Programming Methods
Setting up and solving problems by the simplex and distribution methods; variation in linear programming methods with applications, non-linear programming, discrete programming, and solving input-output and game theory problems. Applications to firm and aggregate economic analysis. Mr. Andrews. Prerequisite: Mathematics 420 or permission of instructor. 4 credits.

758. Introduction to the Location of Economic Activity
Economic theories explaining the behavior of individual firms and consumers in selecting sites for carrying on economic activities. The relationship of these theories to patterns of industrial location, systems of cities, and land use competition in general. Problems of locational change and adjustment and the effects of public policy on spatial economic activities. Mr. Ching. Prerequisite: Resource Economics 715 or its equivalent, Mathematics 425 or its equivalent or permission of the instructor. 4 credits.

795, 796. Investigations in Resource Economics
Special assignments in readings and problems to satisfy students' needs. Staff. 4 credits.

Social Science (45)

These courses are given under the auspices of the Division of Social Science of the College of Liberal Arts.

681, (681). Internships
Field work in a department, agency, or institutional setting of the state or local government, or in a selected and approved private agency. The work will be under the supervision of the department or agency to which the student is appointed. The chairman of the department involved or his representative will be responsible for arranging the student's individual internship program. Prerequisite: internships for seniors only may be approved by the departments of History, Political Science, Psychology, or Sociology or the Whittemore School of Business and Economics. Not more than 16 credits.

697, 698. Social Science Colloquium
A seminar devoted to the study of the social sciences. The unique aspects of political science, psychology, sociology, economics, and history are emphasized, as well as interdisciplinay implications, through extensive written work and discussions. Limited to Ford Foundation scholars. 4 credits. NLG.

Sociology (68)

Stuart Palmer, *Professor and Chairman;* Richard Dewey, *Professor*; Solomon Poll, *Professor;* Murray A. Straus, *Professor;* Melville Nielson, *Associate Professor;* Melvin T. Bobick, *Associate Professor;* Peter Dodge *Associate Professor;* Richard E. Downs, *Associate Professor;* Bud B. Khleif, *Associate Professor;* Pauline Soukaris, *Assistant Professor;* Richard Ingersoll, *Assistant Professor;* Frederick Samuels, *Assistant Professor*; Arnold S. Linsky, *Assistant Professor;* Thomas Burns, *Assistant Professor*; Amnon Orent, *Assistant Professor;* Robert Cabral, *Instructor;* Matthew Cooper, *Instructor;* Howard Shapiro, *Instructor;* Forbes Bryce, *Lecturer*

Anthropology Courses

411. Cultural Anthropology
The concepts and methods of anthropology. The structure of culture; culture and personality; economic, family, educational, political, and religious institutions; art; language. Data concerning various primitive societies are presented. 4 credits.

512. Introduction to World Ethnography
Primarily for sociology majors and minors but also for those with a general interest in sociology or anthropology. Selected studies of peoples in the major ethnographic areas of the world. Particular attention will be paid to historical and geographic factors involved in these areas, types of social and economic organization, and problems involved in the comparative study of human societies and institutions. Prerequisite: Sociology 411 or equivalent, or permission of instructor. 4 credits.

751. Peoples and Cultures of Africa
A survey of African (below the Sahara) social systems. The stress will be on the analysis of segmentary and non-segmentary systems in terms of their variation throughout the continent. The focus will be on "how" these societies solve the problems of daily living in terms of the tribe, clan, and lineage. Prerequisite: Sociology 411 or Sociology 400. 4 credits.

752. Social Problems in Modern Africa
Urban and rural adjustments (acculturation) of tribal systems in Africa (below the Sahara) to the Twentieth Century. This course is a follow-up of Sociology 750 although the latter is not a prerequisite. Prerequisite: Sociology 411 or Sociology 400. A background in sociological theory and methods is desirable. 4 credits.

755. Ethnography of Southeast Asia
A study of the geographical, racial, cultural and historical factors in the development of the area, together with detailed examinations of selected peoples and aspects of their cultures. Prerequisite: Sociology 411 or equivalent, or permission of instructor. 4 credits.

Social Service Courses

621. Introduction to Social Welfare
The field of social welfare: historical analysis, the study implications of contemporary federal-state programs including poverty, social security and public assistance programs. Required for social service majors. 4 credits.

622. Methods of Social Work
Study of social casework, social groupwork, and community organization, differentiating the application of social work processes in psychiatric, medical, and correctional settings. Required for social service majors. 4 credits.

631. Social Welfare Field Experience
To give the student an understanding of social welfare through observation and participation. Social service majors will work in a social welfare setting for a period of at least six weeks; this field work is generally done during the summer following the junior year. Weekly seminar sessions constitute the class-

room work of the course. Prerequisite: Sociology 621, 622, and permission of instructor. Does not count for major credit in Sociology. 4 credits.

Sociology Courses

400. Introductory Sociology
Man's social and cultural relationships as revealed in his customs and institutions. Social theory, methods and techniques of research, and current research findings. 4 credits.

500. Social Psychology
Individual actions, attitudes, ideas, and perceptions as influenced by socio-cultural environments. Individual-cultural relations in education, religion, economics, aesthetics, ethics, and deviant behavior. Prerequisite: Sociology 400, Psychology 401, or sophomore standing. 4 credits.

520. The Family
An anthropological and institutional approach comparing customs and organizations in several societies. Not open to freshmen. 4 credits.

530. Race and Ethnic Relations
Majority-minority group relations. Special attention is given to the nature and results of Negro-White and ethnic group relations in the United States. Not open to freshmen. Prerequisite: Sociology 400. 4 credits.

540. Social Problems
How culture in the form of customs and institutions is related to such human problems as crime and delinquency, alcoholism, physical and mental disease, sex pathologies, poverty, old age, broken families, and racial and religious prejudices. Especially for students who do not intend to major in sociology. Prerequisite: Sociology 400. 4 credits.

560. Rural-urban Sociology
Application of sociology principles to the study of customs and institutions in rural and urban settings. Differentiation between influences upon community organization of culture on the one hand and population size and density on the other. Prerequisite: Sociology 400. 4 credits.

600. Social Institutions
Involves examining the nature of institutions as distinct from other societal forms, and the relationships among such institutions as education, religion, economy, government, paedotrophic and intersex practices, art, and recreation. A cross-cultural approach will be emphasized. Prerequisites: junior standing, six hours of sociology, declaration of sociology as major, or permission of instructor. 4 credits.

695, 696. Honors Seminar
Students works individually on a problem selected by the department member in charge of the seminar. A number of projects are assigned in which emphasis is placed upon the tools of academic research and upon oral and written reports. 4 credits.

697. Junior Tutorial Seminar
A course designed to intensify the intellectual experience of the student and to develop his competence in oral and written presentation. The student will be required to submit several papers or other substantive pieces of work and to engage in discussion and recitation. May be taken either semester of the junior year. Prerequisite: major in sociology; 6 hours of sociology including introductory. 4 credits.

698. Senior Seminar
Various subject areas of sociology: their growth and development, their relationship to one another, and their current status with regard to research and theory. Recent developments and the newer subject areas of sociology. Future developments as extensions of present trends. Students not majoring in sociology may be admitted by permission of instructor. 4 credits.

701. Methods of Social Research
Analysis of research problems; designing field studies and experiments; in-

vestigation of selected research procedures and techniques, e.g., sampling techniques, schedule construction, and interviewing techniques. Prerequisite: major in sociology or social service or permission of instructor. 4 credits.

702. Statistics
Use of elementary statistical techniques in analyses of sociological data. Selected statistical techniques will be examined, e.g., probability, discrete and continuous probability distribution, distribution of sample statistics, nonparametrics, correlation and tests of significance. Prerequisite: Sociology 702 or permission of instructor. 4 credits.

703. Criminology
The scientific study and control of crime. The following are considered: indexes, rates and theories of crime and delinquency, police, courts, probation, prison, and parole. 4 credits.

711. History of Social Theory
An examination of the background and early formulation of sociological theory. Consideration will be given to the writings of classical social thinkers, Descartes, Comte, and Max Weber, among others. 4 credits.

712. Contemporary Sociological Theory
An exposition of the major schools of contemporary sociological theory: functionalism, "verstehen" sociology, symbolic interactionism, reform sociology, neopositivism, and formal theory construction. 4 credits.

720. Current Developments in Sociology of the Family
The theoretical and empirical research on specific aspects of the family. A different topic will be selected each semester to reflect issues of current importance, for example: stratification and the family, intra-family communication, power structure of the family, kinship in modern societies. In addition to critical review of the literature, a class or individual research project will usually be carried out. Prerequisite: 6 credits of sociology, Sociology 520 recommended. 4 credits.

727. Public Policy in Social and Labor Legislation
American social and labor legislation of the recent decades and the way in which American economic and human values have been implemented and modified by law. Legislation and private industry programs in social security, reemployment, unemployment insurance, health services, training and retraining, and fair employment practice. Lectures, discussion, assigned reading, and individual student projects. Prerequisite: one year's work in economics or sociology. 4 credits. This course is the same as Economics 727.

735. Complex Organizations
Analysis of the structure and dynamics of complex, formal organizations (business, military, political and governmental, educational). Emphasis on the construction of theory to account for the findings of empirical studies, both historical and comparative. Special problems treated in the course: power and social control in formal systems; organizational processes, performances, and effectiveness; impact of complex, formal organizations on persons and societies. Prerequisite: permission of the instructor. 4 credits.

740. Culture Change
Various types of society, leading to the development of a theory of culture change. Descriptive studies of institutional as well as theoretical materials selected from the writing of Comte, Marx, Spencer, Durkheim, Spengler, Sorokin, Redfield, and others. Prerequisite: Sociology 400. 4 credits.

741. Social Change and Societal Development
Comparative, interdisciplinary approach to the study of social change. The course focuses on the interrelationships among

economic, political, and social factors in determining the structure, dynamics, character, and level of development of societies. Prerequisite: permission of the instructor. Sociology 740 recommended. 4 credits.

745. Social Stratification
Nature, functions, patterns, and effects of social stratification. Social mobility. The social class system in the United States. Prerequisite: Sociology 400. 4 credits.

761. Population Dynamics
Examination of major population trends including changes in birth and death rates, population characteristics, mobility, migration, world population growth, population problems, and policies of countries at different stages of economic development. Emphasis is on the interrelationship of population and society. 4 credits.

770. Culture, Personality, and Society
A cross-cultural view of the development of personality as emergent from the matrix of genetic, situational, and sociocultural determinants; and an analysis of the dynamic interplay of sociocultural and psychological behavior system. Prerequisite: permission of instructor. 4 credits.

780. Social Conflict
The nature of social conflict, especially war. The setting and initiation of conflict, its dynamics, and the factors affecting its course and outcome. Prerequisite: permission of instructor. 4 credits.

795, 796. Reading and Research in Sociology and Anthropology
A student prepared by training and experience to do independent work under the guidance of an instructor may register for one or more of the following sections: (1) communications, (2) criminology, (3) cultural anthropology, (4) culture change, (5) culture and personality, (6) deviant behavior, (7) ethnology, (8) family, (9) population, (10) rural urban, (11) social control, (12) social differentiation, (13) social movements, (14) social psychology, (15) social research, (16) social theory. Prerequisite: 12 hours of sociology and permission of instructor. Hours and credit to be arranged.

Soil and Water Science (23)

Gordon L. Byers, *Professor and Acting Chairman;* Nobel K. Peterson, *Associate Professor;* Francis R. Hall, *Associate Professor;* Robert S. Pierce, *Adjunct Associate Professor;* Glendon W. Gee, *Assistant Professor*

Hydrology

504. Fresh Water Resources
Designed to provide an adequate background for students desiring to develop a better understanding of fresh-water resources. The subject is approached from the viewpoint of the hydrologic cycle and hydrologic budget or water balance. Major topics include precipitation, evaporation, evapo-transpiration, infiltration, groundwater, and runoff. Consideration is given to control systems and planning for water resource development. Mr. Byers. 3 lectures, 1 laboratory, 4 credits.

703. Soil and Water Engineering
The treatment of engineering principles relating to the control of water. Major topics include precipitation and streamflow measurement, estimating runoff from a watershed, and the design of structures to control this runoff. Subsurface drainage and irrigation systems are studied in detail. Laboratory sessions are designed to acquaint the student with instrumentation and problem analysis. Mr. Byers. Prerequisite: permission of the instructor. 3 lectures, 1 laboratory, 4 credits.

705. Principles of Hydrology
The physical and chemical processes involved in the movement of water through

the rainfall-runoff segment of the hydrologic cycle. Major topics include infiltration and percolation, overland and channel flow, channel processes, and the nature of the stream- discharge record or hydrograph. Laboratory sessions involve the use of a demonstration channel, electrical and fluid models, and selected problems to demonstrate important principles. Mr. Hall. Prerequisite: one year of geology and one year of calculus. 3 lectures, 1 laboratory, 4 credits.

710. Ground-Water Hydrology
Introduction to the principles governing the occurrence, location, and development of ground water. Major topics include well hydraulics, geophysical exploration, and chemical quality of water. Brief treatment given of water law and economics. Laboratory sessions are designed to illustrate principles by use of fluid and electrical models, geophysical instruments, and selected problems. Mr. Hall. Prerequisite: Soil and Water Science 703 or permission of instructor. 3 lectures, 1 laboratory, 4 credits.

Soil Science

501. Introductory Soils
Designed to acquaint the student with the various areas of soil study, such as soil physics, soil chemistry soil microbiology, soil-plant relationships, soil classification, and soil and water conservation. The laboratories are coordinated with the lecture material. Mr. Peterson. 3 lectures, 1 laboratory, 4 credits.

502. Soil-Plant Relationships
Soils in relation to their natural fertility, productivity, and the practices and amendments employed to maintain or increase fertility. Mr. Peterson. Prerequisite: Soil and Water Science 501. 3 lectures, 1 laboratory, 4 credits.

701. Physical Properties of Soil-Water-Plant Systems
Physical properties of soils in relation to their composition, formation, classification, and use as a vital resource. Structure, texture, water retention, and heat transfer in relation to plant growth. Methods of soil physical analysis. Mr. Gee. Prerequisite: one year of physics and one year of calculus. 3 lectures, 1 laboratory, 4 credits.

702. Chemical Properties of Soil-Water-Plant Systems
Chemical properties of soils in relation to their composition, formation, classification, and use as a vital resource. Exchange and fixation of elements in soils and their relation to plant growth. Methods of soils chemical analysis. Prerequisite: one year of chemistry and one year of calculus. 3 lectures, 1 laboratory, 4 credits.

704. Soil Classification and Mapping
The genesis, morphology, classification, and mapping of soils with emphasis on the major classification systems used in the United States and throughout the world as they relate to man's uses of the soil. Prerequisite: Soil and Water Science 501 and an introductory geology course. Mr. Peterson. 3 lectures, 1 laboratory, 4 credits.

709. Soil Interpretation and Community Planning
A review of placement of soils in the classification system used in the United States in relation to the interpretation of soils data for multiple uses, such as housing, recreation, sewage effluent disposal, conservation, transportation, surface runoff, and other soil-use problems common to most communities. Students study soils maps prepared on a town or city basis especially for community planning activities. Mr. Peterson. 2 lectures, 2 credits.

795, 796. Independent Work in Soil and Water Science
Students with a major in the Department are required to take 795 and 796 for two credits per semester in their senior year. The student may choose his faculty consultant and topic from the

options listed below. Students with an interest in some aspect of soil and water science from other departments may also enroll in 795-796 for two credits per course.

(1) Soil-Plant Relationships, Mr. Peterson
(2) Physics of Soils, Mr. Gee
(3) Hydrology, Mr. Byers and Mr. Hall
(4) Chemistry of Water, Mr. Hall
(5) Chemistry of Soils, Mr. Gee
(6) Soil Classification, Mr. Peterson

797, 798. Soil and Water Science Seminar
Discussions on special phases of soil and water problems by students, faculty, and guest speakers. Required of soil and water science majors who are enrolled in 795-796. Staff. No credit.

Spanish and Classics

Michael S. Pincus, *Associate Professor and Chairman;* John S. Walsh, *Professor Emeritus;* R. Alberto Casas, *Professor;* Warren H. Held, *Professor;* Richard J. Callan, *Associate Professor;* Charles H. Leighton, *Associate Professor;* John C. Rouman, *Assistant Professor;* Richard V. Desrosiers, *Instructor;* Richard C. Frankhouser, *Instructor;* Isabel A. Irwin, *Instructor;* Philip J. Sheridan, *Instructor;* Richard C. Spies, *Instructor*

Classics (55)

601-602. Elementary Sanskrit
Prerequisite: permission of instructor. 5 recitations, 4 credits.

611-612. Survey of Greek Literature
The masterpieces of Greek literature in translation. Through the study of literature, the student will learn about the ancient civilization from which much of our contemporary culture has come. A cultural course for the student unprepared to read the original language but desiring acquaintance with the subject matter. A background course for majors in such subjects as English, history, Latin, or the modern languages and literatures. Not open to freshmen. Prerequisite: permission of instructor. 3 recitations, 4 credits. Offered in alternate years with Classics 621-622.

621-622. Survey of Roman Literature
The masterpieces of Roman literature in translation. The object of the course is the same as Classics 611-612. Not open to freshman. Prerequisite: permission of instructor. 3 recitations, 4 credits. Offered in alternate years with Classics 611-612.

695-696. Honors Work in Classics
For seniors writing a research paper in the honors program in classics. Prerequisite: permission of the instructor. 2 or 4 credits.

Greek (58)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

401-402. Elementary Greek
Grammar, simple composition, and translation. 5 recitations, 4 credits.

503-504. Intermediate Greek
Selected readings from Xenophon, Plato, Herodotus, Euripides, and the New Testament. Prerequisite: Greek 402. 3 recitations, 4 credits.

601-602. Greek Prose Composition
A review of Attic Greek grammar; a study of Greek prose style; translation of English into Greek. Prerequisite: permission of instructor. 3 recitations, 4 credits.

751-752. Homer and the Archaic Period
Selected readings from the "Iliad," the "Odyssey," the Homeric Hymns, Hesiod, Pindar, and the Lyric Poets. Prerequisite: permission of the instructor. 3 recitations, 4 credits.

753-754. Athenian Historians
Selected readings from Herodotus, Thucydides, and Xenophon. Prerequisite: permission of the instructor. 3 recitations, 4 credits.

755-756. Athenian Drama
Selected readings from Aeschylus, Sophocles, Euripides, Aristophanes, and Menander. Prerequisite: permission of the instructor. 3 recitations, 4 credits.

757-758. Athenian Philosophy and Oratory
Selected readings from Plato, Aristotle, Lysias, Demosthenes and Isocrates. Prerequisite: permission of the instructor. 3 recitations, 4 credits.

795-796. Special Studies in Greek
Prerequisite: permission of the instructor. 3 recitations, 4 credits.

1. Pre-Socratic Philosophers
2. Hellenistic Greek Authors
3. Theocritus
4. Polybius
5. Greek Authors of the Roman Empire
6. Plutarch
7. Septuagint
8. New Testament
9. Greek Church Fathers
10. Byzantine Authors
11. Spoken Greek
12. Advanced Greek Composition
13. Introduction to Classical Scholarship
14. Greek Epigraphy
15. Greek Dialects
16. Comparative Grammar of Greek and Latin
17. Homer: A Linguistic Analysis
18. Greek Institutions
19. Palaeography and Textual Criticism

Latin (60)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

401-402. Elementary Latin
Elements of grammar, reading of simple prose. 5 recitations, 4 credits. This course cannot be counted for major credit.

503-504. Intermediate Latin
Review. Selected readings from Caesar, Sallust, Livy, Catullus, Horace, Ovid, Plautus, Terence, and Seneca. Prerequisite: Latin 402 or equivalent. 3 recitations, 4 credits.

601-602. Latin Prose Composition
A review of Latin grammar; a study of Latin prose style; translation of English into Latin. Prerequisite: permission of the instructor. 3 recitations, 4 credits.

751-752. Cicero and the Roman Republic
Prerequisite: permission of instructor. 3 recitations, 4 credits.

753-754. Roman Historians
Selected readings from Livy, Sallust, and Tacitus. Prerequisite: permission of instructor. 3 recitations, 4 credits.

755-756. Vergil
Prerequisite: permission of the instructor. 3 recitations, 4 credits.

757-758. Horace
Prerequisite: permission of the instructor. 3 recitations, 4 credits.

759-760. Catullus and Martial
Prerequisite: permission of the instructor. 3 recitations, 4 credits.

761-762. Ovid and the Elegiac Poets
Prerequisite: permission of the instructor. 3 recitations, 4 credits.

763-764. Pliny and Statius
Prerequisite: permission of the instructor. 3 recitations, 4 credits.

791. Problems in the Teaching of Latin in the High School
Prerequisite: permission of the instructor. 3 recitations, 4 credits.

795-796. Special Studies in Latin
Prerequisite: permission of the instructor. 3 recitations, 4 credits.

1. Minor Authors of the Republic
2. Plautus
3. Terence
4. Lucretius

5. Caesar
6. Sallust
7. Minor Authors of the Empire
8. Ovid
9. Seneca
10. Lucan
11. Quintilian
12. Persius and Juvenal
13. Tacitus
14. Suetonius
15. Latin Church Fathers
16. Medieval Latin
17. Advanced Latin Composition
18. Introduction to Classical Scholarship
19. Latin Epigraphy
20. Italic Dialects
21. Comparative Grammar of Greek and Latin
22. Roman Law

Spanish (62)

New students will be assigned to the proper course on the basis of their scores on the College Board achievement test.

401-402. Elementary Spanish*
For students without previous knowledge of Spanish. Aural-oral practice, and the study of fundamental speech patterns, reading and writing to achieve a firm basis for an active command of the language. No credit toward a major. 5 recitations, 2 laboratories, 4 credits. (Students who offer two or more entrance units of high school work in Spanish will not be permitted to register for credit for Spanish 401.)

503-504. Intermediate Spanish*
Intensive and extensive reading of complete texts of intrinsic literary and intellectual worth, formal review of the structure of the language, training in oral and written expression of ideas. Classroom discussion and papers in Spanish. 3 recitations, 1 laboratory, 4 credits. Open by placement examination, and to students who have passed Spanish 402 with a grade of C. Students making a grade of A in Spanish 504 may take courses numbered 750 and above with the permission of the department.

505-506. Introduction to Spanish Literature and Thought*
Reading and analysis of significant works in Spanish literature and thought. Outside readings on the historical and cultural background of the works read. Papers and discussion in Spanish. Term paper in English. 4 credits. This course or its equivalent is prerequisite to all higher courses in Spanish. Open to students who have achieved a grade of C or better in Spanish 504, and by placement examination. Conducted in Spanish.

631, 632. Advanced Spanish Conversation and Composition*
For students who wish to perfect their command of written and spoken Spanish, maintain aural-oral fluency in Spanish through intensive work in and out of the classroom, individual conferences, and laboratory sessions. Prerequisite: Spanish 503 or 504 or equivalent. 3 lectures, 2½-hour laboratory, 4 credits.

695, 696. Honors Work in Spanish
For seniors writing a research paper in the honors program in Spanish. Prerequisite: permission of major supervisor. 2 or 4 credits.

751. Spanish Literature up to 1600
Readings and discussion of the great human creations of early Spanish literature, such as "El Poema de Mio Cid," "El Libro de Buen Amor," and "La Celestina" and their social and historical background. Conducted in Spanish. Prerequisite: Spanish 505 or equivalent. 4 credits.

752. Drama and Poetry of the Siglo De Oro
The social background of the baroque period. Readings of representative plays of Lope de Vega, Tirso de Molina, Cal-

* No student educated in a foreign country will be permitted to register for any Spanish course numbered 650 or below if Spanish is the student's native language.

deron, and the poetry of Lope, Gongora, and Quevedo. Development of the prose of the period. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits.

754. Cervantes
The development of Cervantes' literary art. Reading and discussion of selections from all the major works of Cervantes. Comprehensive study of the Quijote, its originality and significance, its antecedents, its religious, philosophical and sociological aspects, and its artistic structure. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits.

755. Literature of the Nineteenth Century
Preliminary survey of the Eighteenth Century and readings in and discussion of the main literary movements of the Nineteenth Century. Selections from Quintana, Espronceda, Zorrilla, Larra, Duque de Rivas, Bécquer, Pérez Glados, Valera, Pereda, Clarin, and Echegaray. Social and historical background of Spain in relation to Nineteenth Century thought in Europe. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits.

756. Contemporary Spanish Literature
Starting with the generation of 1898, the reading and discussion of the work of such writers as Unamuno, Azorin, Baroja, Machado, J. R. Jiménez, Ortega y Gasset, Garcia Lorca, Pérez de Ayala, Benavente, Casona, plus a survey of Spanish literature and thought since 1939. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits.

765, 766. Spanish-American Literature
The main themes of Spanish-American literature studied in the works of its most representative authors and against the historical, social, and geographical background of the New World. Conducted in Spanish. Prerequisite: Spanish 506 or equivalent. 4 credits.

Spanish-Education 791. Problems in the Teaching of Spanish in the High School
The special objectives, methods, and devices of modern language teaching in high school. For prospective teachers of Spanish. Prerequisite: permission of the instructor. 4 credits.

795, 796. Special Studies in Spanish Language and Literature
Individual guided study in special topics, with training in bibliography and organization of material. Examples of topics that may be selected by instructor and student in conference are:

1. The history of the Spanish language
2. Medieval Spanish literature
3. Spanish literature of the Renaissance
4. Spanish literature of the Golden Age
5. Spanish literature of the Eighteenth and Nineteenth centuries
6. Spanish literature of the Twentieth Century (1898-1936)
7. Contemporary Spanish literature
8. Spanish American literature of the Sixteenth and Seventeenth centuries
9. Spanish American literature of the Eighteenth and Nineteenth centuries
10. Spanish American literature of the Twentieth Century
11. Contemporary Spanish American literature
12. Structural and applied linguistics

Prerequisite: permission of major supervisor. 2 or 4 credits.

Speech and Drama (69)

Joseph D. Batcheller, *Professor and Chairman*; Edmund A. Cortez, *Professor Emeritus;* John C. Edwards, *Associate Professor;* Gilbert B. Davenport, *Assistant Professor;* Frederick P. Murray, *Assistant Professor;* William O. Gilsdorf, *Instructor;* Raymond J. Bernier, *Instructor;* Wilburn L. Sims, *Instructor;* Alice Bowes, *Adjunct Instructor*

402 (402). Communications I
A theoretical approach providing an introduction to speech communication arts and sciences. A major goal of the course is the student's awareness of himself and his role in the wide ranging process of communication. Public speaking, discussion, mass communication, speech science, speech pathology, and oral interpretation are representative communication areas. Required of all majors; two lecture demonstrations and a two-hour laboratory-discussion section. Team taught with guest lectures. Staff. 4 credits.

403 (403). Communications II
Through emphasis on performance the student will experience various forms of communication, both verbal and nonverbal. The goal will be to sensitize the speaker to aspects of the process of communications, including understanding and adapting to receivers, language choice, maximizing attention, message organization, effective listening, delivery techniques, idea selection, and development. An emphasis on self-analysis and interpersonal evaluation should result in improved effectiveness as an oral communicator. Staff. 4 credits.

435. Theatre and Its Drama I
Dramatic theory with emphasis upon the metaphorical approach and the modern theatre. Survey of theatre areas, personnel, and methods. Attendance at University Theatre and Allied Arts productions. Minimal participation in University Theatre productions. Mr. Batcheller and Staff. 4 credits.

436. Theatre and Its Drama II
Theatre and drama history and theory in its social framework from the beginnings to 1800. Mr. Batcheller and Staff. 4 credits. (Alternate years.)

438. Theatre and Its Drama III
A continuation of Speech and Drama 436 from 1800 to the present. Mr. Batcheller and Staff. 4 credits. (Alternate years.)

457. Oral Interpretation
The analysis of literature as a basis for performance; demonstration and experimentation with methods of performance which will enhance particular pieces of literature; the development of a critical standard for evaluation of performance, and consequently, of literature. Mr. Edwards. 2 lectures, 2 laboratories, 4 credits.

459 (459). Scenic Arts I
Technical aspects of theatrical production. Stage and television scenery construction and painting. Properties, sound, and backstage organization. Survey of costumes and lighting. Practical application in University Theatre production. Mr. Bernier. 4 credits.

501 (501). Debate Workshop
Students examine argumentation as a process of rational decision-making by exploring and applying debate techniques. Exploration includes such areas as types of propositions and debates, proofs, the structure of reasoning, research and case development, methods of refutation. Application involves active participation in a variety of debate formats: audience debating, parliamentary debating, tournament debating. May be repeated. Mr. Sims. 2 credits.

503. Group Communications
An examination of communication behavior in small groups. The goal will be increased sensitivity to the dynamics of interaction with emphasis on speaking, listening, process, leadership, self-perception, and behavioral patterns developed in formal and informal group situations. Increased communication effectiveness will be sought through evaluating and experiencing small group discussions and projects. Mr. Gilsdorf. 1 lecture, 2 laboratories, 4 credits.

506. Persuasion
Examines the nature, function, methods, and problems of influencing human behavior. The study of both modern and classical theory is combined with per-

formance in a variety of communication situations with particular emphasis upon audience analysis as a necessary function of effective persuasion. Mr. Gilsdorf. 4 credits.

521. Speech and Hearing Science
Anatomical, neurological, and physiological bases of the vocal and auditory mechanisms. A synthesis of the natural and physical sciences needed for human communication. Study of the processes of respiration, phonation, articulation, and audition. Acoustical and physical properties of speech. Staff. 4 credits.

524. Applied Phonetics of American English
An introduction to phonetics through use of the international phonetic alphabet primarily in the analysis of the sounds of American English. Study and transcription of American and foreign dialects in conjunction with the professional interest of the student. Staff. 4 credits.

547 (547). Scenic Arts II
Stage costume. Play analysis, color coordination, fabrics, period styles, costume charts, schedules, and plates; patternmaking and costume construction for the stage. Participation in one major University Theatre production or the equivalent. To be taken concurrently with Speech and Drama 549. Mr. Davenport and Staff. 2 credits.

549 (549). Scenic Arts III
Stage Lighting, Atomic theory, principles of electricity and color, stage lighting method: light plots and instrument schedules. Survey of innovations in lighting equipment and techniques. Participating in one major University Theatre production or the equivalent. To be taken concurrently with Speech and Drama 549. Mr. Bernier and Staff. 2 credits.

551. Rehearsal and Performance I
Fundamentals of stage action for performer and director: movement and use of stage with emphasis on visual arrangement; theatrical speaking and the use of sound for auditory patterns. Exercises and criticism. Mr. Edwards and staff. 2 credits.

522. Rehearsal and Performance II
Continuation of Speech and Drama 551. Application of prior training to scenes and short plays. Mr. Edwards and staff. 2 credits.

555. Introduction to Mass Communications
The nature, development, and societal effects of mass communication in our society. Emphasis will be on a particular understanding of broadcasting, although its relation to film and printed media will be examined. The techniques of radio as a basic medium through studio practice and production. Students will also be introduced to television. Staff. 2 lectures, 1 laboratory, 4 credits.

602 (602). Special Problems in Communication Disorders
Individual or group projects to enrich or expand theoretical or applied experiences. By permission and arrangement with faculty. Variable credits of 2, 4, 6, or 8. May be repeated to a maximum of 8 credits.

608. Advanced Speech Composition
In a writing-and-speaking workshop students explore problems and methods of written message preparation designed for oral delivery. Includes analysis of past and contemporary speeches as models, preparation and delivery of various speech types to understand and refine methods, skills and techniques of written/oral communication. Mr. Sims. Prerequisite: Speech and Drama 402 or 403, expository writing, or their equivalents. Permission of instructor. 4 credits.

621. Creative Dramatics
The theory and technique of teaching creative dramatics, introducing methods useful to classroom teachers, art and music teachers, special teachers, recre-

ation specialists, and therapists. Study of guided child improvisation, including drama appreciation, story telling, story dramatization, interaction of the arts, and puppetry. Includes observation of classes conducted by a master teacher and practical application of theory. Staff. 4 credits.

622. Theatre for Children
The art of children's theatre production for both school and recreation programs. Students will observe and take part in the production of a play for children. Staff. 4 credits.

631. Speech Pathology I
An examination of the etiology and treatment of the more common speech disorders. Emphasis is given to speech development, articulation problems, and stuttering. Mr. Murray. Prerequisite: Speech and Drama 403 or permission of instructor. 4 credits.

632. Speech Pathology II
The nature of speech disorders of psychological and physical origin. Identification, case-study method, observations, referral procedures, and rationales for therapy are discussed. Pertinent research is reviewed regarding aphasia, cerebral palsy, mental retardation, and emotional disturbance. Speech/voice/language therapy is considered in an interdisciplinary contex. Prerequisite: Speech and Drama 631. 4 credits.

634 (634). Clinical Practice in Speech Pathology
Supervised experience in diagnosis and therapy with speech handicapped children and adults. Discussion and demonstrations of therapeutic procedures and practices. Initial experiences are provided with school-age children with articulation disorders in individual and group therapy. Mr. Murray. Prerequisite: Speech and Drama 632 and 524. 4 credits.

638. Language and Speech Development
An examination of the pertinent research in the acquisition of language and speech in the normal child. Physical, intellectual, social, cultural, linguistic, and psychological processes. Individual measurement and observation of children's language functioning. Staff. Prerequisite: developmental psychology or equivalent. 4 credits.

652. Scenic Arts IV
Fundamentals of scene design. Problems and exercises in the design and construction of stage settings, including action and movement analysis, two- and three-dimensional composition, drafting of plans and working drawings, execution of painters' elevations, value drawings, and color renderings of perspective projections. Major project: completion of a scale model setting for an assigned play. Mr. Davenport. Prerequisite: Speech and Drama 459, 547-549. 4 credits.

654 (654). Performance Project
Application of acting and directing theory to specific assigned responsibilities in a University Theatre production or to an individual performance project. Prerequisite: Speech and Drama 551, 658. To be taken in conjunction with Speech and Drama 655, but not concurrently. 2 credits. (Can be repeated to 4 credits.)

655 (655). Scenic Art Project
Application of experience in design and technical aspects of theatre to specific assigned responsibilities in a University Theatre production or to an individual project or presentation. Prerequisite: Speech and Drama 459, 652. To be taken in conjunction with Speech and Drama 654, but not concurrently. 2 credits. (Can be repeated to 4 credits.)

657. Rehearsal and Performance III
Continuation of Speech and Drama 552. The performer and director develop interaction of character. Ensemble techniques. Mr. Edwards and staff. Prerequisite: Speech and Drama 551 and 552 or the equivalent. 2 lectures, 2 laboratories, 4 credits.

658. Rehearsal and Performance IV
Continuation of Speech and Drama 657 and of the sequence begun in Speech and Drama 551 and 552. Styles of drama for the actor and director: Greek, Shakespearean, Eighteenth Century comedy, and Nineteenth Century realism. Mr. Edwards and staff. Prerequisite: Speech and Drama 551 and 552, 657, or the equivalent. 4 credits.

668. Group Interpretation
Choric speaking, reader's theater, chamber theater, and other forms of group interpretation in theory and practice. Mr. Edwards. Prerequisite: Speech and Drama 457. 4 credits. (Alternate years.)

671. Seminar in Criticism of Contemporary Communication
Analysis and evaluation of contemporary rhetoric. The first several weeks will concentrate on developing criteria and methodology for effective criticism, the remainder on a contemporary speaker, movement, or communication phenomena mutually agreed upon by the seminar members. Examples are campaign rhetoric, the rhetoric of racism, the rhetoric of student activism, classroom speaking, etc. Because of the shifting nature of the course content, the seminar may be repeated for additional credit. Mr. Gilsdorf. Prerequisite: Speech and Drama 403 or permission of instructor. 4 credits.

691. Laboratory or Field Experience
An emphasis on communications. Taken in the senior year. Staff. 4 credits.

693. Theatre Management
Theatre organization, public relations, business, and box office management with projects associated with University Theater activities. Special topics may be explored by the individual. Mr. Batcheller. Prerequisite: four courses in theatre. 4 credits. (Alternate years.)

704. Audiology
Pathologies of the auditory system and their electrophysical measurement. Hearing conservation programs in the school, community, and industry are reviewed. Technique of pure-tone audiometry is the major focus. Prerequisite: speech and hearing science or permission of instructor. Staff. 4 credits.

705. Aural Rehabilitation
Principles, techniques, and materials involved in auditory training and speech reading instruction for the hard-of-hearing or deaf individual. Emphasis will be given to the psychology of the aurally handicapped person within the hearing world. Staff. Prerequisite: Speech and Drama 704 or permission of instructor. 4 credits.

697 (697). Senior Seminar I
A review of the recent developments and trends in the oral communication arts and sciences. Stress will be laid upon inter-relationships and varied methods of research. Students will prepare short written and oral research reports in preparation for their senior paper and/or project. Mr. Batcheller and staff. Prerequisite: senior standing. Once a week for two hours, 2 credits.

698 (698). Senior Seminar II
The development of an individual paper and/or project in a specific area of oral communication arts and sciences. Mr. Batcheller and staff. Prerequisite: senior standing. Meets individually and as a group. 2 credits.

795, 796. Independent Study
Application of the theory of specific speech communication areas in indivi-ual or group projects. May be repeated and taken for variable credits of 2, 4, 6, or 8. Could be combined with the senior experience (for majors) for a total of 12 credits in the same semester if the student wished to be free to study off-campus. Project is to be developed with supervising instructor. Staff.

Technology (79)

601. Statistical Methods in Engineering and Physical Science
Methods of organizing data and statistical techniques for data analysis as applied to problems in engineering and physical science. Elementary probability theory and probability distributions. Correlation and regression analysis. Design of experiments; factorials, fractional factorials, designs for process optimization. Introduction to quality control; construction and analysis of control charts for variables and attributes; statistical aspects of tolerance. 4 credits.

Zoology (70)

Paul A. Wright, *Professor and Chairman;* C. Floyd Jackson, *Professor Emeritus;* Edythe T. Richardson, *Professor Emeritus;* Lorus J. Milne, *Professor;* Wilbur L. Bullock, *Professor;* Emery F. Swan, *Professor;* Philip J. Sawyer, *Professor;* Paul E. Schaefer, *Associate Professor;* Marcel E. Lavoie, *Associate Professor;* Arthur C. Borror, *Associate Professor;* Frank K. Hoornbeek, *Associate Professor;* John J. Sasner, *Associate Professor;* Robert A. Croker, *Assistant Professor;* Edward N. Francq, *Assistant Professor;* John E. Foret, *Assistant Professor;* Edward K. Tillinghast, *Assistant Professor*

(412), 412. Principles of Zoology
Concepts of animal biology, including an introduction to ecological relationships, anatomy, physiology, embryology, taxonomy, and evolution. Staff. 4 credits.

507-508. Human Anatomy and Physiology
An integrated presentation, by systems, of structure and function in the human body. Lectures are strongly oriented toward physiology. Weekly laboratories alternate between dissection of a preserved small mammal and physiological exercises, involving observations on living tissues. Mr. Lavoie. 4 credits.

518. Vertebrate Morphology
A study of the basic morphological features of the vertebrates. The structure of the major systems will be studied at both the macroscopic and microscopic levels. Mr. Bullock. Prerequisite: Zoology 412. 4 credits.

527. Comparative Vertebrate Physiology
Designed to complement Zoology 518 in comparing the functioning of vertebrate organ systems. Mr. Wright. Prerequisite: Zoology 412. 4 credits.

530. Zoological Techniques
A functional background of specialized procedures useful for research and study in zoological areas. Topics will include preservation, fixation, sectioning, staining, microscopy, photomicrography, and use of such instrumentation as is available and depending on the needs of the students enrolled. Mr. Schaefer and Mr. Milne. Prerequisite: Zoology 412 and permission of the instructor. 4 credits.

542. Ornithology
Birds, their identification, migration, life histories, and economic importance, with special reference to those of Eastern North America. Mr. Borror. Prerequisite: one semester of biology. 4 credits.

604. Principles of Genetics
An introduction to the chemical and physical basis of inheritance; genes as units of mutation, structure and function in heredity and development. Organization of the genetic material. Taught by Genetics faculty from departments of Biochemistry, Microbiology, and Zoology. Prerequisite: Zoology 412 or equivalent. 4 credits.

606. Neurology
Practical sudy of morphology, physiology, and histology of the human nervous system, for students in occupational therapy. Mr. Milne. Prerequisite: Zoology 508. 4 credits..

703. Genetics
A course intended for students desiring more detailed training in fundamental genetics. This course, as well as Genetics 705 and 770, required for genetics students. May be elected by others. Mr. Hoornbeek. Prerequisite: Zoology 604 or equivalent. 4 credits.

704. Comparative Endocrinology
The various endocrine organs, vertebrate and invertebrate, with particular emphasis on endocrines which relate to physiology of reproduction. Mr. Tillinghast or Mr. Wright. Prerequisite: Zoology 527 or equivalent and organic chemistry. 4 credits.

711. Natural History of Cold-Blooded Vertebrates
The various classes of poikilothermic vertebrates, their habits, habitats, and life histories with special reference to those occurring in eastern North America. Mr. Sawyer. Prerequisite: Zoology 412 and 518 or equivalent. 4 credits.

(712). Mammalogy
The origin and diversification of mammals, their ecology and economic imporance. Laboratories will emphasize techniques of the mamalogist and identification of local forms. Mr. Francq. Prerequisite: Zoology 412 and 518 or equivalent. 4 credits.

(713). Animal Behavior
Individual and group behavior patterns of animals with the role of anatomy, physiology, and prior experience emphasized. Techniques and the practical application of the study of animal behavior. Mr. Francq. Prerequisite: One year of zoology. 4 credits.

715. Natural History of Marine Invertebrates
A field and laboratory course aimed at acquainting the student with the inshore marine invertebrate metazoan animals of northern New England. Emphasis will be on identification, classification, habitat preferences, and behavior of these animals. Field work (collection and observation) will constitute a major part of the course and the student must be prepared to assume some travel expense. Staff. Prerequisite: general zoology. 4 credits. (Also offered in Summer Session.)

721. Parasitology
An introductory course on some of the more important parasites causing diseases of man and animals. Living materials will be used as far as possible. Mr. Bullock. Prerequisite: one year of zoology. 4 credits.

725. General Physiology
The fundamental physiological properties of excitability, contractility, conductivity, metabolism, growth, and reproduction. Mr. Sasner. Prerequisite: one year of zoology and organic chemistry. 4 credits.

729. Vertebrate Embryology
The fundamental principles of vertebrate development up through establishment of the principal organs and systems, exemplified in the laboratory by study of representative embryonic forms. Mr. Foret. Prerequisite: general zoology. 4 credits.

772. Fishery Biology
Designed to introduce the student to some of the information and techniques of the freshwater fishery biologist. Emphasis on freshwater fisheries but many of the techniques and some of the reading pertain to saltwater fisheries as well. Mr. Sawyer. Prerequisite: Zoology 711 or equivalent and permission of instructor. 4 credits.

795, 796. Special Problems in Zoology
1. Bibliographic methods
2. Ecology
3. Endocrinology
4. Evolution
5. Embryology
6. Genetics
7. Histology
8. History of zoology
9. Invertebrate zoology

10. Physiology
11. Vertebrate zoology
12. Zoogeography
13. Zoological techniques
14. Parasitology
15. Histochemistry
16. Protozoology
17. Systematics
18. Animal behavior

Election of one or more sections of this course provides opportunity for advanced study. Work may involve reading, laboratory work, organized seminars, and/or conferences. Prerequisite: permission of staff concerned. 2 or 4 credits. (Limit of 12 credits from the sections of this course.)

Enrollment Statistics — Fall Semester — Durham Campus Only

	Agriculture				Liberal Arts				Technology				Whittemore School			
	1965-1966	1966-1967	1967-1968	1968-1969	1965-1966	1966-1967	1967-1968	1968-1969	1965-1966	1966-1967	1967-1968	1968-1969	1965-1966	1966-1967	1967-1968	1968-1969
Regular Curricula																
Senior	66	58	82	107	532	549	628	788	136	166	164	163	96	82	75	109
Junior	57	85	108	139	589	756	875	987	122	140	141	141	90	91	123	127
Sophomore	89	116	151	118	890	1090	1076	1196	180	184	183	190	91	120	125	174
Freshman	126	128	126	114	1230	1171	1365	1409	234	216	274	221	110	122	155	151
Total — regular curricula	338	387	467	478	3241	3566	3944	4380	672	706	762	715	387	415	478	561
Associate degree curricula																
2nd Year, T.S.A.S.	62	85	99	109												
1st Year, T.S.A.S.	143	164	139	136												
Total	205	249	238	245												
Short Curricula																
Extension Credit Courses	1229	1438	1351	1316												
	1965	1966	1967	1968												
Summer School*	1457	1533	1690	1740												

* Does not include Institutes and Special Summer Session in Technology.

	Other				Men				Women				Both			
	1965-1966	1966-1967	1967-1968	1968-1969	1965-1966	1966-1967	1967-1968	1968-1969	1965-1966	1966-1967	1967-1968	1968-1969	1965-1966	1966-1967	1967-1968	1968-1969
Regular Curricula																
Senior					477	501	553	651	353	354	396	516	830	855	949	1167
Junior					463	601	669	754	395	471	578	640	858	1072	1247	1394
Sophomore					697	831	862	924	553	679	673	754	1250	1510	1535	1678
Freshman					904	870	1042	1009	796	767	878	886	1700	1637	1920	1895
Special	75	94	88	112	35	38	46	53	40	56	42	59	75	94	88	112
Graduate	595	702	779	718	472	520	580	520	123	182	199	198	595	702	779	718
Total — regular curricula	670	796	867	830	3048	3361	3752	3911	2260	2509	2766	3073	5308	5870	6518	6964
Associate degree curricula																
2nd Year, T.S.A.S.					62	76	88	106	0	9	11	3	62	85	99	109
1st Year, T.S.A.S.					133	150	130	120	10	14	9	16	143	164	139	136
Total					195	226	218	226	10	23	20	19	205	249	238	245
Short Curricula																
Extension Credit Courses					849	858	539	665	380	580	812	651	1229	1438	1351	1316
					1965	1966	1967	1968	1965	1966	1967	1968				
Summer School*					738	776	955	830	719	757	735	910				

* Does not include Institutes and Special Summer Session in Technology.

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